

# THE IRON AGE

New York, December 18, 1930

ESTABLISHED 1855

VOL. 126, No. 25

## Ancient and Modern Metal Work In Glass and Steel Building

By JOHN NELSON

JOHN W. HIGGINS, president and treasurer of the Worcester Pressed Steel Co., Worcester, Mass., has established a museum, named the John Woodman Higgins Armory, which is devoted to the development of the working of iron and steel through the ages to the present day. The chief purpose was to present a visual history of the art of pressed steel, and Mr. Higgins, in his years of collecting, has carried out his intention in a magnificent manner. His collection is housed in surroundings of marked beauty.

This armory occupies the upper portion of the Pressed Steel company's new office building, which is a comprehensive example of the advance which has been made in the use of steel in architecture. The exterior walls are all steel and glass. There is no overlying material. Aluminum bronze paint provides the

protective covering, giving to the building the appearance of polished steel and making it a conspicuous feature of the landscape over a wide territory.

The armory will be given its formal opening early

next year, and afterward will be open free to the public daily. It is wholly unique. Through many centuries the evolution of the working of iron and steel was chiefly in the development of arms and armor, and these form the principal parts of the collection. Therefore it is fitting that they be exhibited, as they are, in high vaulted Gothic baronial halls and galleries.

On the walls hang fine old paintings, some of them very valuable, and historic tapestries, each in some way illustrating the fashioning of steel. Standing about on the floors are mailed and armed knights and squires and men-at-arms. Some of these noble figures are





THE glass and steel building recently completed in Worcester, Mass., to house the Worcester Pressed Steel Co. and the John Woodman Higgins collection of armor and other ancient steel work, is an example of the modern trend in architecture of commercial and factory structures. Standard structural shapes emphasize continuous vertical lines, while extensive use of glass permits a maximum of light. Instead of seeking to conceal the



mounted, their horses, too, fully clad in armor, over which hangs rich panoply. Here and there is a cannon of a period when gunpowder was new in warfare. Heraldic banners on their staffs give gay color above. It all combines to make a picture, colorful, beautiful and romantic.

#### *Scope of Exhibits*

From the armor and arms which went with it, the armory collection shows the further development of the art of sheet steel through more recent centuries down to the present day. This part of the collection will include the products of the important pressed steel mills of America and foreign countries, each manufacturer having his own plate glass showcase set in an alcove. Provision is made to keep the collection up to date at all times in the future.

The scope of the exhibit covers many centuries,

extending back long before Christ was born. No stronger contrast could be drawn than that between the mounted mailed knights who dominate one great nave and the chassis of a high power automobile which dominates the other—90 per cent pressed metal, appropriately designed, accurate and efficient.

#### *The Building Itself*

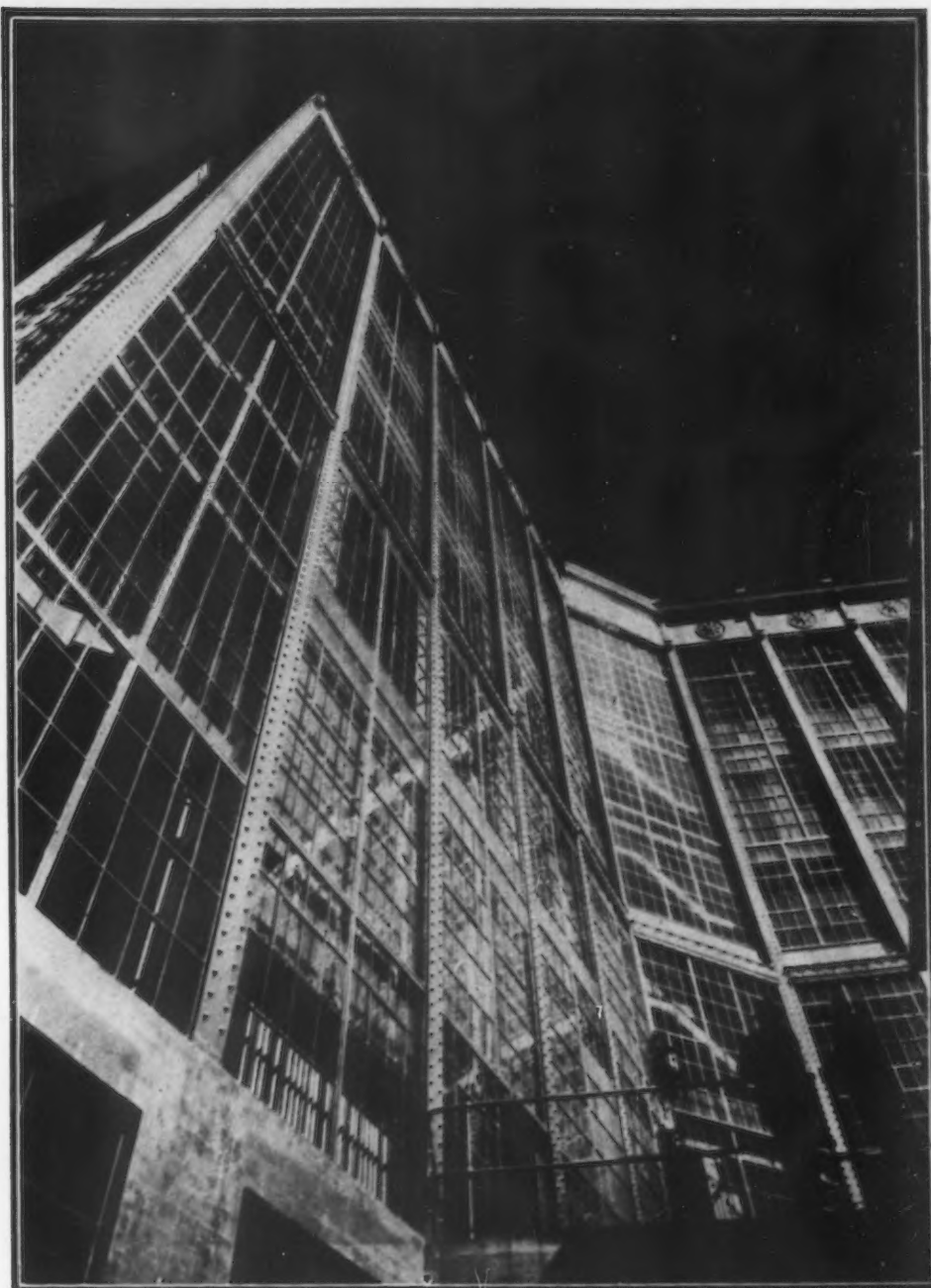
Speaking generally, the building is of mill construction with all steel and glass exterior walls. The deeply recessed vertical structural columns are the visible architectural members, together with the cover plates and the abnormally large rivet heads the arrangement of which gives strong emphasis. The effect of the powerful vertical sweep is a most impressive sight.

Continuous steel sash set for effect in various planes fills the sections in between. The exterior is crowned



riveting, it has been brought into prominence by the use of rivets with larger than ordinary heads.

The structural steel was sandblasted after erection and painted with a heavy coating of aluminum bronze paint, touched out here and there with black. The entrance doors and architraves are of rustless steel frames and plate glass, with grilles of forged steel. The first floor is of battledeck construction.



by a frieze of steel plates having conventional patterns in perforated metal, and a flat metal crown mold in which the bands of cornice castings, emphasized by wrought iron scrolls at each point of support, serves to exemplify the various methods of working and joining metals by rolling, casting, stamping, punching, forming and forging. The entire exterior was sandblasted and covered with several coats of aluminum bronze paint, which is touched out here and there with black.

The building consists of two wings of approximately equal length which form an obtuse angle to conform to the street lines, with a central recessed entrance at the blunt point of the angle. The doorway, under a heavily crested marquee of steel and wrought iron, is framed in perforated wrought iron. The doors are of plate glass in stainless steel frames, with protective grills of polished art-forged steel. The beautiful vestibule and octagonal reception lobby give

access to stairs and elevator to the main offices of the Worcester Pressed Steel Co. on the second floor, and to the armory above.

The third floor occupies two full stories of the building, permitting of mezzanine galleries and lofty vaulted naves. Here is housed the great collection which Mr. Higgins has assembled from Europe and Asia as well as from America. The two wings, one 100 ft. long, the other 90 ft., are occupied each as a Gothic nave, 35 ft. high to the groins. Along the side of each is a gallery or aisle. Beneath each gallery is another aisle. The two naves are joined by a lofty octagonal vestibule.

#### *The Interior of the Building*

The walls throughout are the soft warm tint of caen stone, the ceilings are the color of the sky. At the farther end of each great hall is a rose window executed in a design which is typical of the 14th



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 ONE of the two Gothic naves in the John Woodman Higgins Armory at Worcester, which will contain a visual history of sheet metal. The arch to the right opens into an octagonal vestibule.  
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century and filled with deep-colored leaded glass.

The architect has succeeded in giving the suggestion of a maze. The visitor will be induced to wander about a bit in finding the way to this or that alcove or aisle. The heavy doors and the woodwork, which is sparingly used, are all of old English gnarled oak, ornamented with semi-polished hand-forged hardware and trimmings of Gothic design, all after a medieval baronial fortress in the Austrian Tyrol, which for five centuries had housed many of the suits of armor and crusaders' weapons of the Higgins collection.

#### *Some of the Rare Exhibits in the Museum*

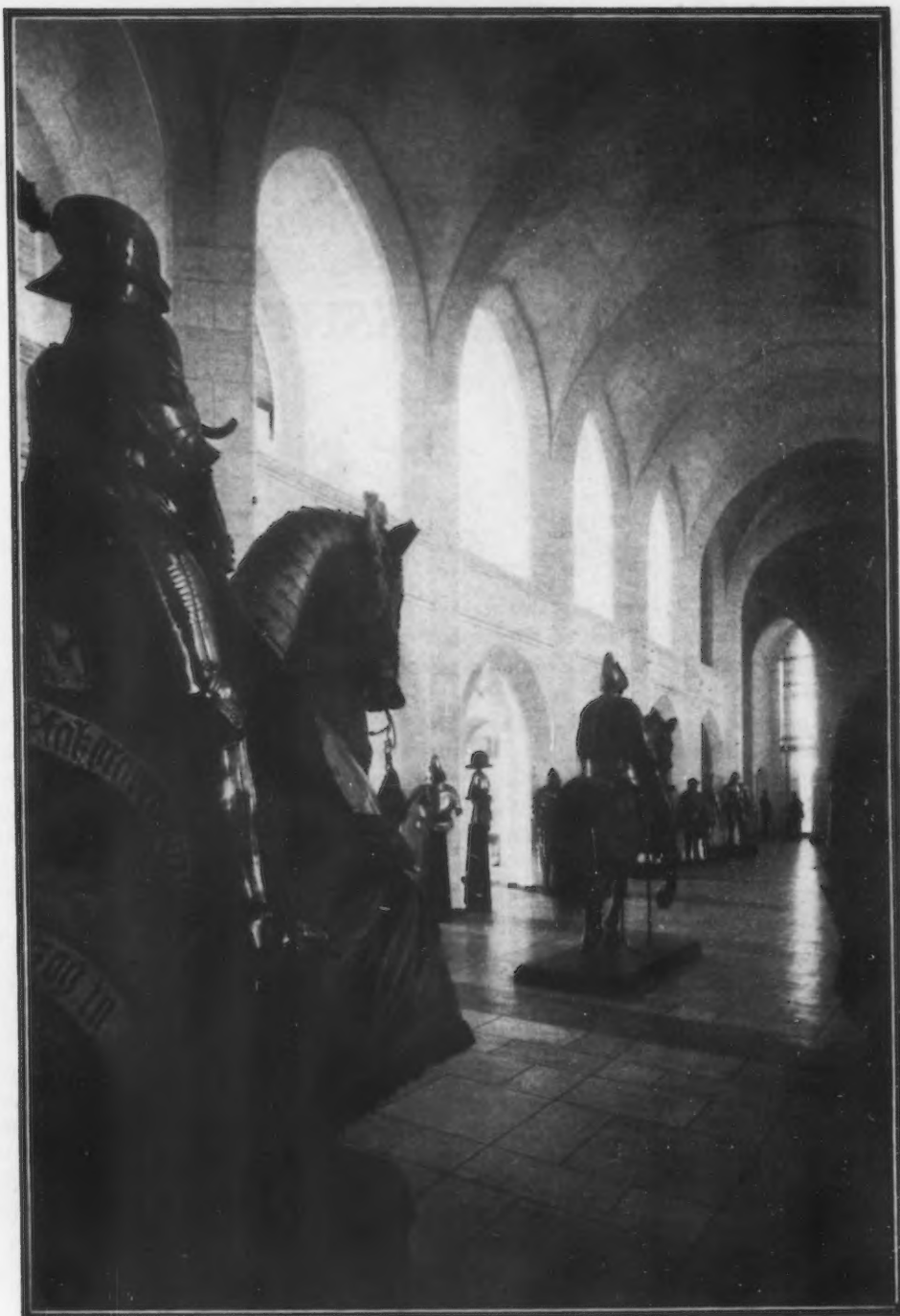
The east wing, 90 ft. long, is devoted to medieval art craft. It contains pieces of the stone age, bronze age and iron age, but chiefly the collection consists of examples of the craft of the smiths of the centuries

when men fought in armor. There are implements, old paintings, glass and tapestries. To the collector, all of these are "documents," because each presents in some manner a phase of the evolution of the art. For example, a picture or statue or image may show a type of armor or arms, no specimen of which is known to exist.

Many of the pieces in the collection have historic and romantic associations. True tales could be told of them, some of bold daring and adventure and fine chivalry, some of bloody cruelty, some of the gentler phases of human life in the olden days.

As an illustration, hanging on the end wall of the medieval nave, under the rose window, is a great Gobeline tapestry, which was designed by Charles Le Brun for Fontainebleau by order and under the personal supervision of King Louis XIV. That royal

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**A**RMOR of the Middle Ages from various parts of Europe. The glass and steel walls of the building of the Worcester Pressed Steel Co., which houses the Higgins collection, are beyond the deep-recessed arches.  
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personage likewise watched the tapestry through its weaving, that it might be exactly what he had set his mind on. Many copies have been made of this splendid piece, but that in the armory is the original.

Another striking decoration of the wall of this nave has equally intimate association with the French court. It is an armorial wall hanging fabricated as a gift to celebrate the marriage of Louis XVI and the ill-fated Marie Antoinette. Its design includes the coats-of-arms of Austria and France and also the order of the Golden Fleece, with its flint and steel and fire and the Golden Fleece itself.

The names of great nobles are associated with the armor and arms. One of the knights who sits astride his charger in front of the Fontainebleau tapestry is clad in armor that was worn by a famous 16th century noble, Count Radzidall, who could boast that he had

fought twenty duels with Maximilian I. To this emperor, history relates, the jousting tournament was as golf links are to some men of today—irresistible. His friendship and admiration for Count Radzidall were so great that he presented him with thirty suits of mail. Presumably, the harness in the Higgins collection is one of these. The Count may have worn it in his jousting at Innsbruck or Vienna.

The soft-tinted walls with their beautiful and picturesque decorations form an appropriate background for the knights and men-at-arms who stand about, each clad cap-a-pie in plate armor, or who sit their horses, lance at rest, ready to run a friendly tilt, or, if need be, to fight. These mounted figures represent the advance of the smith's art and the successive contributions of the Gothic, Maximilian and Renaissance periods of history.



# X-Ray Inspection of Welds in Pressure Vessels

By DR. ANCEL ST. JOHN

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Service Corp., New York

A NOTABLE development during the past year in the industrial use of X-rays is the routine inspection of welded seams in pressure vessels. A brief account of a typical installation for this purpose was included in the paper on "The Application of Fusion Welding to Pressure Vessels" presented before the American Welding Society by J. C. Hodge of the Babcock & Wilcox Co.<sup>a</sup> The present paper is a more detailed description of the X-ray installation and its operation.

The X-rays used for the examination of heavy metal sections, such as these welded seams, are produced when electrons, traveling at high speed in an

exhausted bulb, strike a heavy block or "target" of tungsten placed at the center of the bulb. The electrons are supplied by a heated filament, as in a radio tube, and the speed is imparted by applying an extremely high voltage between the filament and the target. The X-rays thus produced are passed through the wall of the vessel including the welded seam and are recorded on a photographic film placed on the far side of the wall. Cavities, cracks and inclusions are more transparent than steel and so appear as darker regions on the negative and lighter regions on the prints.

During operation shop personnel must be protected from accidental contact with the high potential lines by means of grounded metal shields, and against continued exposure to the X-rays by screens of absorptive material. It is important that these screens prevent the escape of secondary or "scattered" X-rays as well as the primary rays.

The X-ray installation thus includes the following elements:

1. A power plant capable of producing at least 250,000 volts and sufficiently light and compact to be mounted on a movable base.
2. An X-ray tube capable of operating continuously at 220,000 volts or more.
3. Grounded metal shields surrounding all high-voltage equipment.
4. Absorbing screens consisting of  $\frac{1}{4}$ -in. lead or the equivalent, surrounding the X-ray tube except where the rays are to be used, and similar auxiliary screens for absorbing any primary rays which may pass the object being examined.
5. Absorbing screens consisting of  $\frac{1}{16}$ -in. lead or the equivalent to cut off all secondary or "scattered" rays.

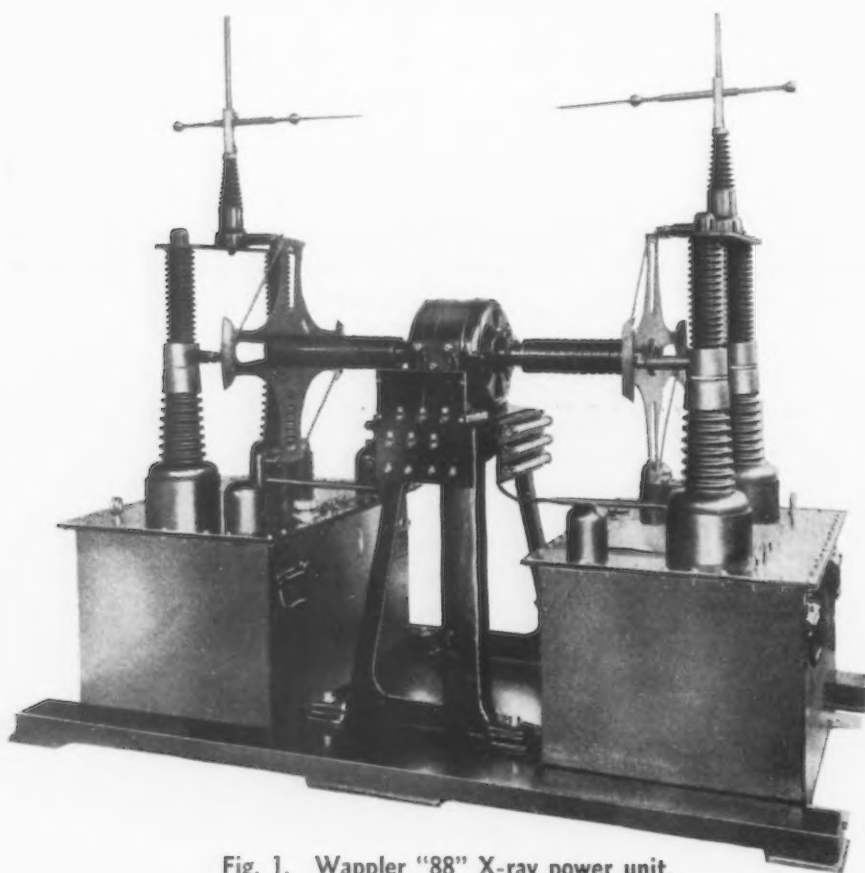


Fig. 1. Wappler "88" X-ray power unit.

AS welding becomes more general some method of determining its soundness is essential. The X-ray equipment used for this purpose at the Barberton, Ohio, plant of the Babcock & Wilcox Co. is here described by the man who installed it. Welded pressure vessels, up to 3 in. thick, are successfully and rapidly inspected. Added interest attends this discussion because of the proposed specifications for fusion welding of unfired pressure vessels, recently made public, in which X-ray inspection is mandatory.

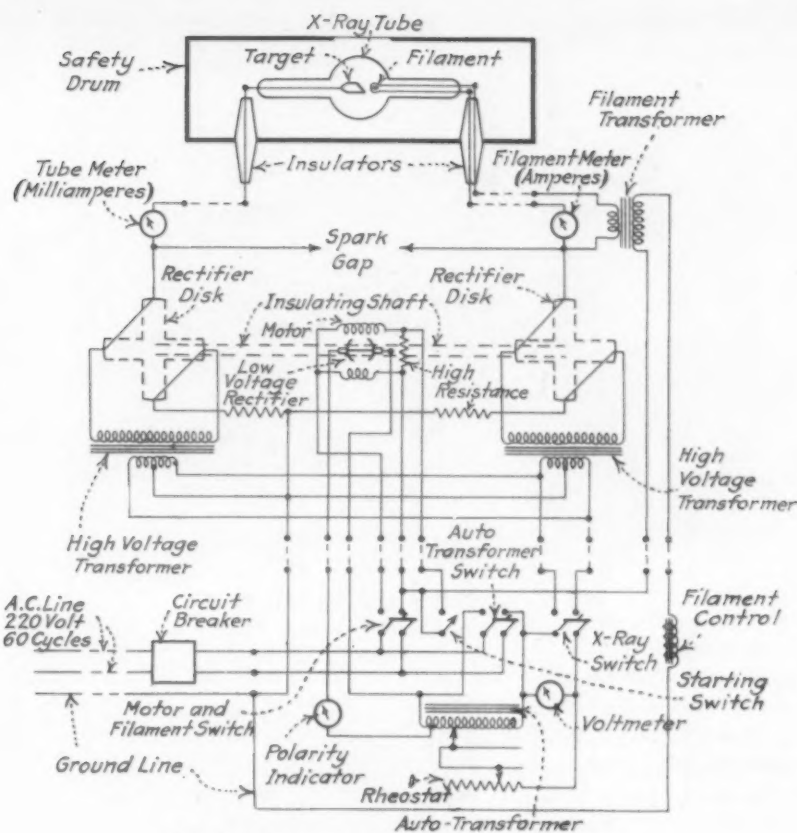


Fig. 2. Diagram of electrical connections.

6. Film holders or cassettes, adapted to the particular work in hand.
7. Means for supporting the vessel under examination in proper relation to the X-ray tube and for moving the vessel relative to the tube and film without disturbing this relation.
8. Equipment for developing the X-ray films and for examining the negatives.

The power plant which produces the high voltage for exciting the X-ray tube is shown in Fig. 1, and the electrical connections are shown in Fig. 2. The power is supplied by two high-voltage transformers, each capable of transforming single-phase alternating current from 220 volts to 150,000. The primary windings are connected in parallel with the line through a control cabinet, and the secondary windings are connected in series with the X-ray tube through a pair of rectifying disks driven by a synchronous motor.

In this way voltages as high as 300,000 can be applied to the tube. This is somewhat higher than the maximum capacity of the tubes at present available. The value of the high voltage is controlled by suitable adjustment of autotransformer and rheostat connections in the control cabinet. The supply of electrons and hence the current through the X-ray tube is controlled by the heating current supplied to the filament from an auxiliary low-voltage transformer insulated for 150,000 volts.

Fig. 3 is a diagram showing the general arrangement of X-ray tube, vessel, photographic film and lead shielding for the examination of a welded pressure ves-

sel and Fig. 4 is a photograph made during the inspection of a longitudinal seam in a drum 30 ft. long, 4 ft. diameter with 2 1/4-in. wall. The power plant is mounted on a truck frame within a grounded metal housing. The X-ray tube is mounted within a lead-covered metal "safety" drum provided with a suitable window permitting the X-rays to reach only a limited region along the welded seam. Auxiliary lead shields fit snugly against the outer face of the vessel and extend for several inches from the region exposed to primary rays so as to provide effective protection against scattered rays which are absorbed in these shields or in the wall of the vessel itself.

The film is placed in a film carrier which is lead-covered and provided with auxiliary shields fitting snugly against the inner face of the vessel. Personnel

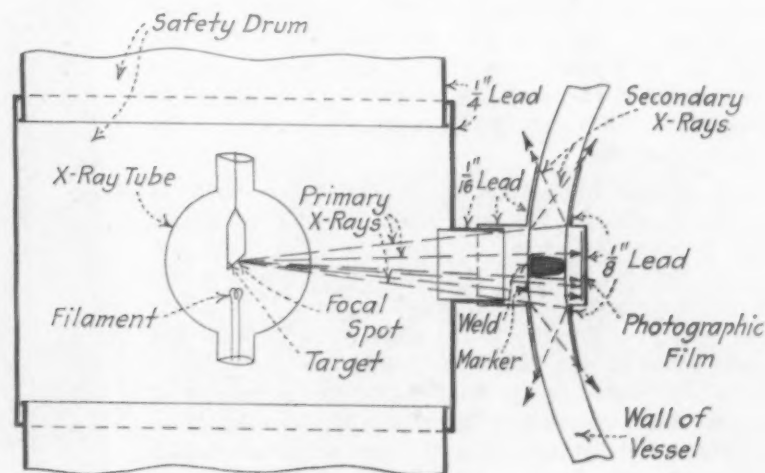


Fig. 3. Diagram of arrangement.

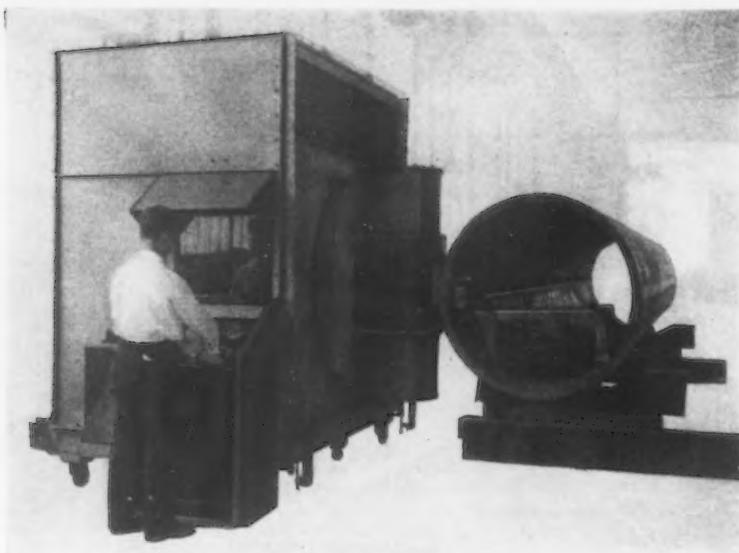


Fig. 4. Barberton installation.

is thus amply protected. The vessel is placed with its axis parallel to a guide rail attached to the steel frame of the building. A pair of guides on the truck frame maintain the X-ray tube at a fixed distance from the vessel as the truck is moved longitudinally to examine successive portions of the weld. The film carrier is mounted on a framework which is likewise moved longitudinally so that during an exposure the film is opposite the window in the safety drum. For examination of girth seams, a different shape of window and another type of film carrier are used, and the vessel is rotated about its axis.

In routine, pictures are made for each foot of longitudinal seam and each 20 to 30 deg. of girth seam. The extent of girth seam that can be examined at one time depends upon the diameter of the drum as the rays toward the end of the film have to pass diagonally through the wall and so traverse considerably more steel. The seams are marked off into regions of these dimensions and each region is assigned a reference number, which is marked on or alongside of the seam, together with a reference mark at the center of the region.

A different type of reference mark indicates the boundary between adjacent regions on the inner surface. Perforated metal markers are placed upon the reference marks and another perforated metal marker carrying the vessel number and any other pertinent data are fastened in front of the film holder. In this way each film carries its own identification marks and proof that the X-rays have penetrated all parts of the region examined.

A typical radiograph of a longitudinal seam is shown in Fig. 5. The weld itself is not distinguishable because the excess metal on both the inner and outer surfaces has been removed, and the weld metal is perfectly sound. It is almost impossible to locate the weld by difference in the appearance of weld and plate zones of the film. The weld zone can only be definitely located by its relationship to the images of the reference markers which were placed on the drum at a definite distance from the center of the welded joint. Actual density determinations of this weld metal gave a value of 7.83, which is only 0.2 per cent

less than the theoretical density of steel of this composition. Gas holes, whether large or small, appear as sharply defined rounded spots as in Fig. 6. The welded zone in this case can be readily located. In Fig. 7 slag inclusions extending along the walls of the joint are indicated as more or less cloudy elongated areas.

To determine the exact location of defects, an exposure is made with the X-ray tube displaced a short distance, say 2 in., transversely to the weld. The tube is then shifted to the same distance on the other side of the weld and a second exposure is made on the same film. From the relative displacements of the outer surface markers, the defect and the inner surface markers, the depth of defect below the outer surface can be calculated. A typical double exposure radiograph is shown in Fig. 8; the defect marked "D" being the one located graphically in Fig. 9.

The radiographs are made with a standardized technique in which all the exposure conditions affecting the character of the pictures are held constant during the examination of each vessel. These conditions are:

1. Distance from source of X-rays, i.e., the "focal spot" on the target, to the photographic film, usually 20 in.
2. Distance of film from inside surface of vessel, usually  $\frac{1}{2}$  to 1 in.
3. Type of film used, usually double-coated safety X-ray film.
4. Type of fluorescent screens used for intensifying the photographic record and so shortening the time of exposure, usually Wappler combination screens.
5. Intensity of X-rays, governed by the current through the X-ray tube, usually 4 milliamperes.
6. Wall thickness of vessel.
7. Penetrating power of X-rays, determined by the voltage applied to the X-ray tube.
8. Time of exposure.

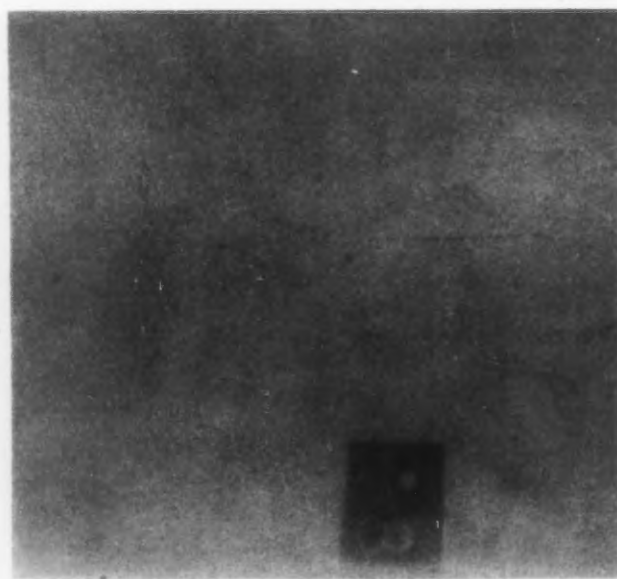


Fig. 5. Radiograph of longitudinal seam; sound metal.



The voltage applied to the tube and the time of exposure are chosen to suit the wall thickness. For walls, 2 in. or more thick, the maximum voltage that can safely be applied continuously to the X-ray tube is used—about 220,000 volts. Excellent pictures are secured through 2¼ in. with 3 min. exposure. For thicknesses below 2 in., an exposure of 1 or 2 min. is used and a reduced voltage is chosen to give a satisfactory result. Excellent pictures have been made through 1¼ in. at 160,000 volts in 2 min.

Under these conditions cavities having a depth of 2 per cent of the wall thickness are readily detected, those as small as 1½ per cent can be observed on careful study and some as small as 1 per cent have been detected. If desired, a calibrating device, consisting of a perforated sheet of metal 2 per cent of the wall thickness, can be used to record upon each film the difference in photographic density due to such a cavity. The correct exposure times or reduced voltages are tabulated or plotted on calibration curves.

The installation is also adapted to the examination of castings, as well as to diffraction analysis by the high-voltage pinhole method originated by the author<sup>b</sup>. For diffraction analysis the pinhole diffractometers are attached to the safety drum at convenient locations which do not interfere with weld or castings inspection and the exposures are made simultaneously with inspection exposures. Castings are mounted in front of the safety drum, or below it, if it has been rotated into the horizontal position. Movable lead shields are placed around the casting to protect personnel from scattered rays.

<sup>b</sup> Dr. Ancel St. John, "High Speed, High Voltage X-Ray Diffraction Analysis of Metals" *Transactions of the American Society for Steel Treating*, 1928, pages 485-492.

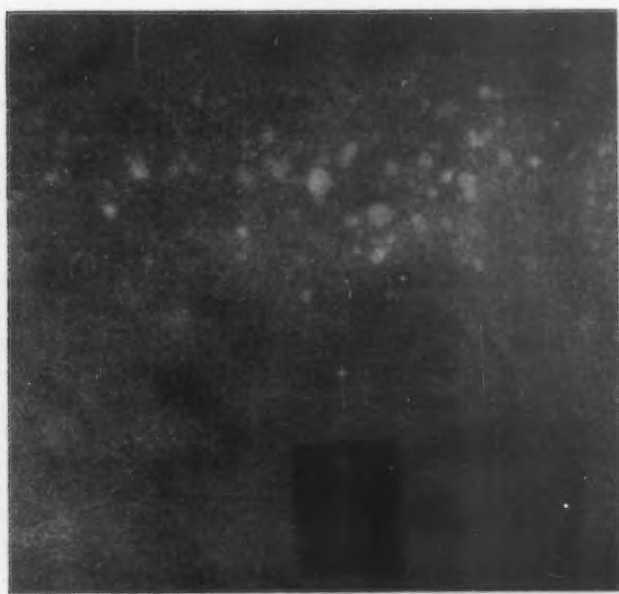


Fig. 6. Radiograph of porous weld.



Fig. 7. Radiograph of weld containing slag inclusion.

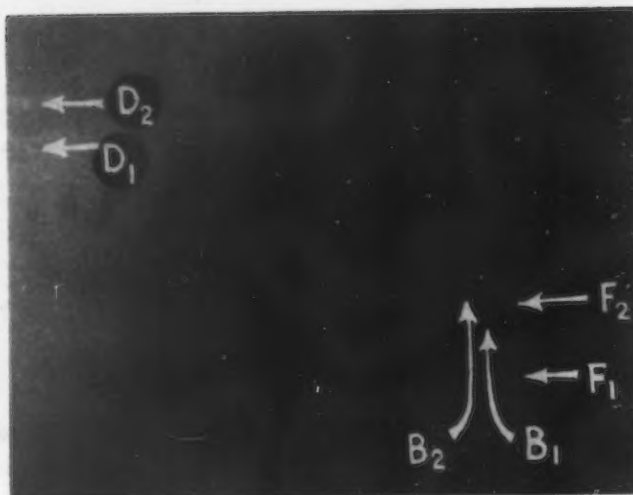


Fig. 8. Double exposure radiograph for localization of defect.

The entire cost of such an installation, including transportation charges, local construction, engineering fees and thorough training of personnel in the technique and interpretation of metal radiography should not exceed \$15,000. The operating cost will depend upon the basis upon which the investment is written off, upon the labor rate, the overhead factor and the amount of use. With favorable conditions it should be brought as low as \$5 per hour, plus the cost of film. Under these circumstances the cost per foot of welded seam can be as low as:

Plate thickness, 2 in. or less	\$0.40
2½ in.	0.75
2¾ in.	1.00
3 in.	1.50
3¼ in.	2.75

Thus the cost of X-ray inspection for a vessel about 32 ft. long by 4 ft. diameter with 3-in. wall, having two longitudinal seams each 30 ft. long and two girth seams each 12½ ft. long, would be \$150 or less. For a similar vessel with 2-in. wall, it would be under \$50.

#### Practice in Germany

Routine X-ray inspection of welded pressure vessels is economical as well as feasible. In Germany, the X-ray machine is used right in the boiler house and the vessels are inspected after installation and possibly after having been in service for some time. In doing this, the X-ray tube is mounted through the man-hole inside the vessel and the films are placed against the outer surface.

Modern developments in electric arc welding and the experience with large pressure vessels will eventually convince the purchasers and operators that structures and pressure systems, welded under correct pro-

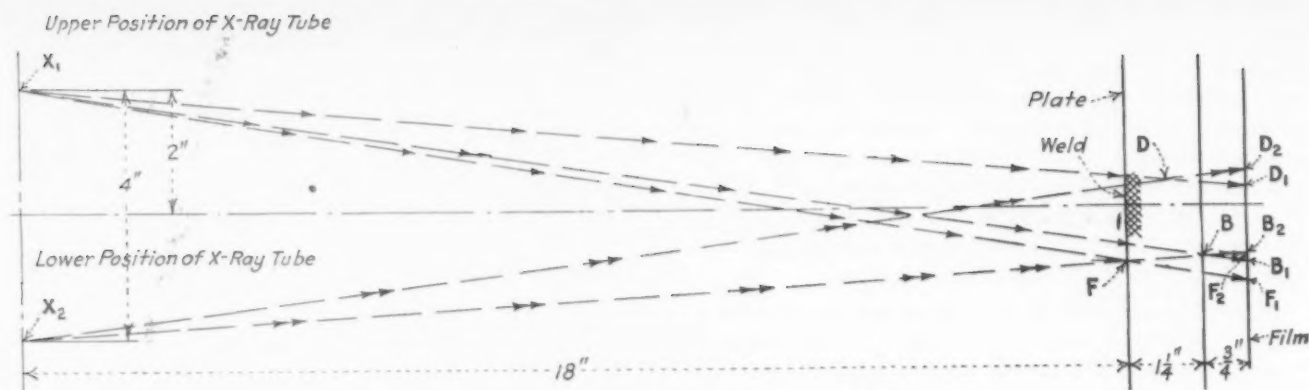


Fig. 9. Diagram for localization of defect by double exposure.

cedure control and proved by the X-ray to be perfect, are eminently safe and desirable. At present, it is as unfair and intemperate to say that all welds are bad as it is to say that all welds are good. Means are avail-

able for separating the good from the bad, and any user of metal fabrications, who fails to use them, is blinding himself to opportunities which are being grasped by his competitors.

## Influence of Cold Rolling on Various Kinds of Steel

THE effect of definite degrees of reduction in cold rolling on physical properties is a subject recently investigated by E. Greulich (*Stahl und Eisen*, Oct. 2, 1930). Plain carbon steels, nickel and chrome steels, and monel metal of the following compositions were tested:

	C	Si	Mn	P	S	Cu	Ni	Cr
1. Carbon steel...	0.12	0.00	0.40	0.017	0.024	....	....	....
2. Carbon steel...	0.29	0.06	0.40	0.020	0.013	....	....	....
3. Carbon steel...	0.34	0.18	0.57	0.024	0.017	....	....	....
4. Carbon steel...	0.46	0.30	0.75	0.021	0.028	....	....	....
5. Carbon steel...	0.61	0.34	0.83	0.022	0.016	....	....	....
6. Nickel steel...	0.18	0.26	0.49	0.020	0.021	....	5.14	....
7. Chrome steel...	0.08	0.42	0.34	0.003	0.024	....	0.39	12.56
8. Chrome steel...	0.15	0.62	0.46	0.042	0.021	....	0.94	15.36
9. Chrome steel...	0.19	0.56	0.45	0.019	0.010	....	0.56	14.50
10. Cr-Ni steel...	0.37	0.00	2.02	0.028	0.033	....	35.20	10.50
11. Monel metal...	0.15	0.02	1.82	0.020	0.015	30.40	66.80	....

The plain carbon steels contained spheroidal cementite, the carbon in the corrosion resisting pearlitic steels was almost entirely in the pearlitic form, while the austenitic steel contained a minimum of precipitated carbides. The materials were received in the form of 1½ in. billets. These were first rolled to ½-in. square sections and then annealed for 3 hr. as follows: The carbon steels at 1200 deg., the nickel steel at 1130 deg., the monel metal at 1470 deg. and chrome steels at 1650 deg. Fahr., followed by slow cooling to 1290 deg. and then air cooled to develop pearlitic structure. The austenitic steel was annealed 2 hr. at 2010 deg. Fahr. and then quenched in water.

After pickling and cutting to 2-ft. lengths, the test pieces were ground to exact dimensions (0.495 in. square). Comparisons with the original materials showed negligible changes in hardness in preparation of the specimens.

The test pieces passed between a pair of smooth rolls operating at 80 ft. per min. Before the second pass, the work was rotated about its axis 90 deg. so as to produce approximately square sections. The re-

duction amounted to about 25 per cent, but by means of additional passes it was possible to reduce the carbon and nickel steels and the monel metal about 50 per cent. After a month's aging at room temperature, the degrees of reduction were measured, and the tensile strength, Brinell hardness, and Rockwell hardness were determined.

The hardness was found to be uniform throughout the cross sections. The following table shows the effect of varying reduction on the hardness of soft and hard materials:

Sample No.	Reduction in Area, Per Cent	Average Rockwell-C Hardness
3	1.5	—1.2
3	49.3	21.4
6	1.4	13.2
6	47.8	27.6
11	1.4	—1.9
11	48.9	25.3
5	1.54	20.6
5	52.4	33.8

The hardness as well as the elastic limit increase rapidly with a corresponding decrease in elongation at reductions exceeding 1 per cent; the strength and reduction of area under tension show little change up to 6 per cent reduction. Above 10 per cent reduction all properties change less rapidly, the hardness increasing slowly, and the decrease in reduction of area under tension being the most marked change.

The change in these properties for all the materials tested was found to be directly proportional to the logarithm of the per cent reduction in cold rolling, up to 30 per cent reduction. The same proportionality factor between tensile strength and log. per cent reduction held for all the common steels, independently of their carbon contents, and also for the alloy steels with pearlitic structure. The increased value of the proportionality factor for austenitic chrome-nickel steel and for monel metal indicates the influence of composition and space lattice.

# Straight-Line Output and Mechanical Handling in a Radiator Plant

By G. L. LACHER



**S**TRAIGHT - LINE production and mechanical handling of materials have made the St. Paul, Minn., plant of the American Radiator Co., a low-cost unit. From the raw materials to the finished product everything is arranged with a view to minimizing hand labor and expediting the flow of the work. In fact, the layout and equipment have proved so satisfactory that they have been duplicated to a large extent in the company's new works at Neuss, Germany.

## Trolley-Type Molding Machines

The outstanding feature of the foundry is a group of four continuous molding machines. Each unit comprises 18 hangers suspended from a track. On the top rail of the track are two rollers supporting the weight of the hanger, while four guide rollers engage the side of the rail. A cable, which passes around a

**C**ONTINUOUS suspended molding machines, continuous sand handling and continuous washing, painting and drying of radiators are features of a manufacturing system arranged for economical production in large quantities.

Ingenuity on the part of the management has supplemented the layout and equipment in promoting efficiency. Castings are cooled in an unheated sand storage room. Through heat interchange the temperature of the castings is lowered and the sand is kept from freezing. Cables attached to the controls of the cupola charging machine enable one of the scale car men to start the elevation of charging buckets while the other is climbing the stairs to the charging floor. This arrangement eliminates the need for an extra man to operate the charging machine.

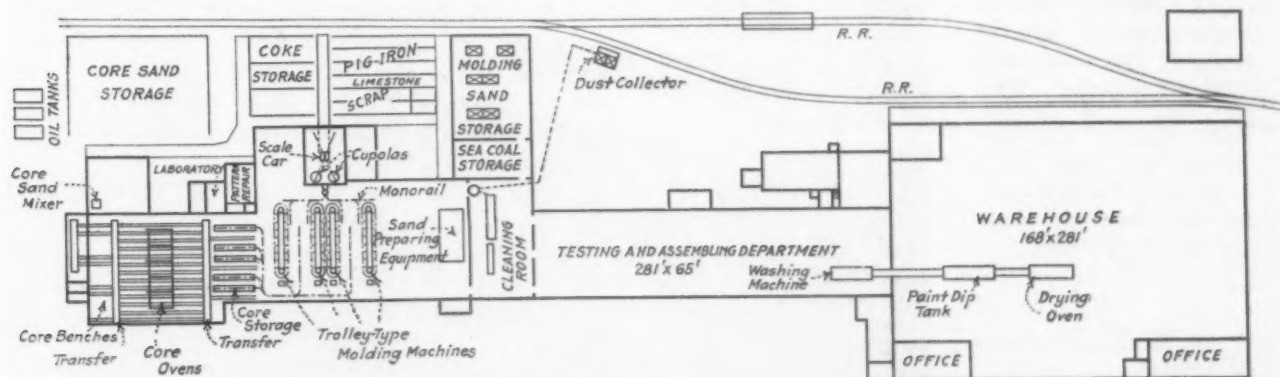


flat rimmed wheel at each end of the conveyor, pulls the hangers from one position to the next. Power is supplied by an air cylinder, which drives a broken finger the length of the piston, which is equal to the distance between two hangers. Upon the completion of its stroke the piston returns to normal position, the broken finger sliding over the hanger that it engaged when moving forward. Each hanger supports a top plate and a bottom board.

## Iron Moved by Monorail

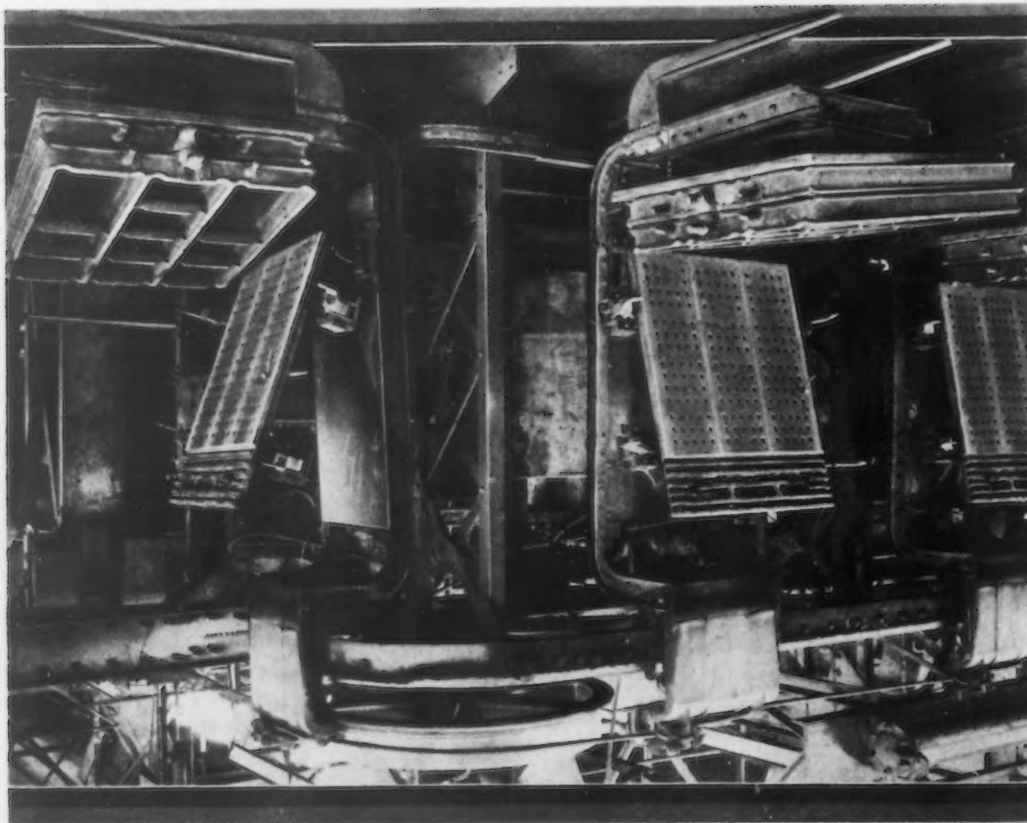
Paralleling the molding machine on both sides are overhead monorails from which iron ladles are suspended. One iron

pourer serves each conveyor unit, getting his iron at the cupolas and moving it by chain hoist trolley to the completed molds. A strainer gate core is used to pour radiator castings, because it insures a more even distribution of the iron through the mold. To be used



From the raw material yard to the warehouse the American Radiator Co. plant is planned for uninterrupted flow of the work.





▲ ▲ ▲  
Each hanger on the molding machine supports a top plate and a bottom board. The hangers are suspended from a track and are pulled from one position to the next by a cable, drawn by an air cylinder.  
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successfully, however, the iron must be kept hot.

The monorails from all four of the molding systems converge into a turntable in front of the two cupolas, so that a ladle may be transferred from any one of the branches to another. The pouring ladles are filled from a mixing ladle, which receives molten metal from the cupolas.

Counting the iron pourer, only seven operatives are required per molding unit. Two men make the

drags, setting the chaplets, dumping sand on the drag pattern and passing an automatic sand rammer over the mold. One of these operatives also sets the cores. Another set of two men is required to mold the copes, which are made in a similar manner. Completed drags are swung on to the bottom boards by pneumatic hoist suspended from the same monorail system that carries the ladle hoists. Then the copes are superimposed on the drags. Finally, another operative puts on the

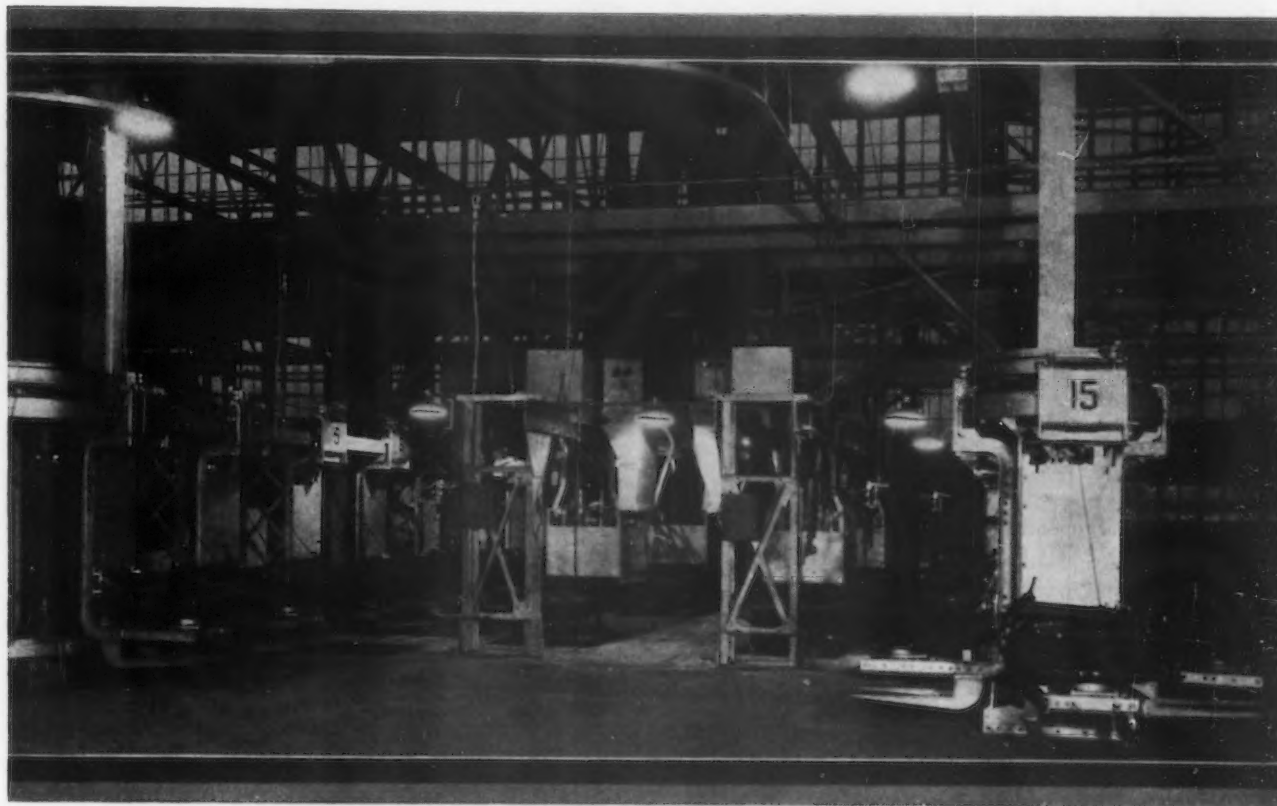
▲ ▲ ▲  
An automatic rammer simplifies molding. First the molders pile sand on the drag or cope flask. Then the rammer moves forward and a plow-shaped leveling board scrapes the sand off the mold to a predetermined level. Rammer feet play on the mold, peening the sand around the flask bars. A second plow smooths out the trenches made by the peaners.  
▼ ▼ ▼



top plate and clamps the closed mold, at the same time turning the valve that controls the pneumatic drive for the entire molding unit. Since he performs these operations for two molding machines he counts as only one-half operative per unit.

The top plate on each hanger is swung on a counter-weighted cable, making it easy to lower or raise. When lowered, hooks from the top plate are fastened

molders pile sand on the drag or cope flask. Then the rammer is started in its forward movement. A plow-shaped leveling board with a straight edge on the bottom scrapes the sand off the mold to a predetermined level, following which the rammer feet play on the mold. These have peaners on each side which pean the sand around the flask bars. The feet incidentally have compression springs, so that their action is a



Two molding machines with molding sand hoppers and rammers shown between them.

at four points underneath the bottom board and then the assembly is tightened by two eccentric clamps.

#### Each Machine Turns Out 85 Molds an Hour

After the mold is poured it is passed to the end of the machine farthest from the cupolas and shaken out. The shakeout man unclamps the mold, raises the top plate and then transfers the flask by air hoist to a grating, bumping the flask up and down by actuating the air valve on the hoist. The sand sifts down to a sand recovery belt beneath the floor, while the sprues are knocked off the casting and thrown into a nearby bucket, which is later taken away by lift truck.

A loader transfers each casting from the shakeout to a steel tray. He uses a fork to handle the castings, since they are still very hot, as only 6 min. elapses from the time of pouring to the time of shaking out. Lift trucks are used to transport the casting trays. Since one loader serves two molding units, he is counted as one-half an operative per machine.

Each molding machine makes an average of 85 molds an hour, the number varying above or below the average according to the size of the work.

The automatic rammer, which was designed by company engineers, is an unusual machine. First the

cushioned, rather than a pounding, impact. The rammers, moreover, work on an eccentric shaft, which gives them an alternating movement.

After the ramming operation, a second plow passes across the trenches made by the peaners and then passes back again, making a smooth, firm surface. The machine is motor-driven. The whole cycle of operations is controlled by a lug on a continuous chain. As the lug drives ahead it causes the forward operations of leveling board, rammers and plow. As it drives back, it carries the second plow through its final movement.

The safety of the operatives has been guarded. A sheet steel shield in front of the machine throws up a counterweight if struck, automatically stopping operations. In addition, in back of the machine, a safety finger has been provided, which operates a knife switch stopping the motor. The finger is a most positive safety guard, since an operative must raise it before the machine can proceed in its forward movement.

#### Sand System Is Continuous

The molding sand system, like the molding operations, is continuous and provides for the recovery and



reuse of shakeout sand, as well as the spill sand from molding. A continuous steel apron conveyor runs underneath all four of the shakeouts, carrying the sand to a grate, through which it is discharged to a bucket elevator. It then is conveyed to a squirrel cage riddle, where the tramp iron is removed, and is thereupon dropped into one of two 8-ton storage bins.

The bins feed the sand through measuring hoppers to Simpson mullers, in which new sand, water and sea coal are added. The mixers (one for each bin) discharge the sand to a belt, which carries it to the bottom of a bucket elevator. Another belt, passing under the floor, feeds spill sand to the bucket elevator, and the material is then raised to a mixer consisting of large blades centrifugally driven, from which it is discharged into a large storage tank, having a capacity for nearly two carloads.

Sand drawn from the tank is carried up another elevator and discharged on an overhead distributing belt. Scrapers along this belt are set at different levels so that each takes off a given amount for a molding hopper. The last scraper, of course, scrapes sand off down to the belt.

#### Castings Cooled in Sand Storage Building

The new molding sand required is unloaded by yard crane through hatches in the roof of a sand storage building which is situated adjacent to a railroad siding. Ordinarily a supply of 35 carloads (for winter consumption) of such sand is kept on hand. One of the difficulties originally experienced in handling the storage sand was that it would freeze during cold weather, since the section of the building in which it is kept is unheated. This disadvantage was overcome when the superintendent conceived of the novel plan of using the storage room as a cooling chamber for hot castings. Thus through heat interchange the castings are cooled and the sand is kept from freezing.

Adjoining the sand storage in the same wing of the plant is a room for storing chaplets and bags of sea coal and fire clay.

The raw material yard is conveniently located, paralleling one side of the building. It is served by a spur from the Midway Transfer Railroad and is commanded by a 5-ton overhead electric traveling crane, built by the Milwaukee Electric Crane & Mfg. Co., Milwaukee. At one end of the yard are three storage tanks, one each for linseed oil and crude oil for core making and a third for fuel oil, which is used to heat the core ovens. A large space next to the core department has been provided for core sand storage, but it is now planned to buy dried core sand in box cars, ordering it as needed.

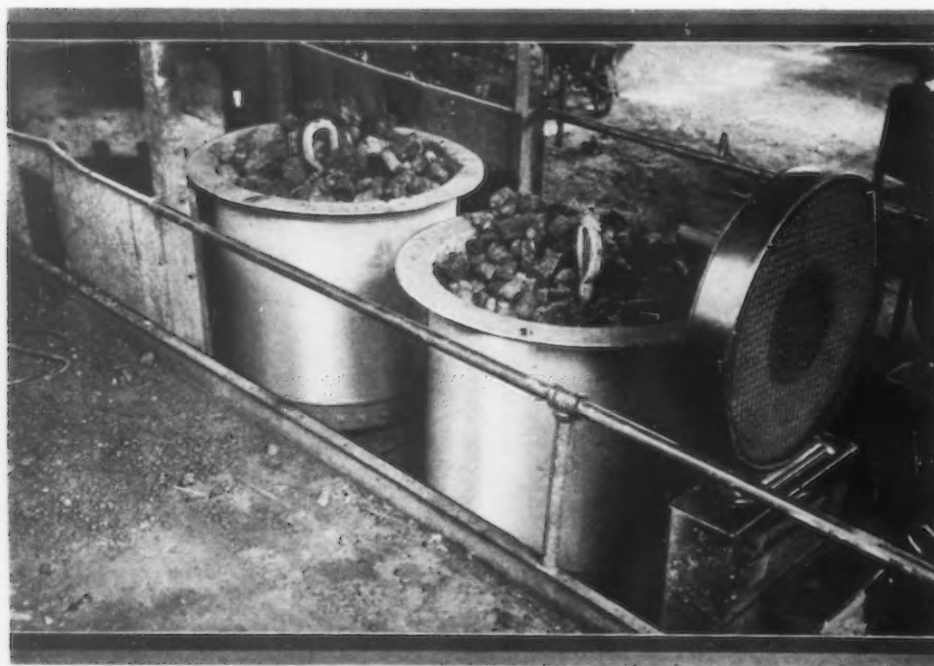
The section of the yard used for storing metal and coke is bisected by a scale car track which leads to the cupolas. The coke storage consists of three bins, with capacity for four carloads of coke each. On the opposite side of the scale car track are three bins for pig iron and two for scrap. The latter holds three carloads of scrap each. The former hold considerably more tonnage in pig iron, since iron can be stored more compactly than scrap. A sixth bin on the same side is for limestone, having two carload capacity.

#### Two Men Operate Scale Car and Charge Cupolas

The scale car is operated by storage battery and has two 4000-lb. Toledo scales, one for each of two charging buckets. Coke is transferred from bin to bucket by wheelbarrow, while limestone is shoveled and scrap and pig iron are loaded by hand. All remelt, sprues, returned bad castings, etc., are brought to the yard in a bucket by lift truck and transferred to charging bucket by chain block from a monorail above the scale car track.

Two operatives do all the work of loading the charging buckets, operating the scale car and charging the cupolas.

The two cupolas are Whiting No. 9 units. To handle the slag a monorail has been supplied on the slag notch side. An air hoist is suspended from the rail and is used at both cupolas. However, a chain block on the same monorail is held in reserve. Water drips con-

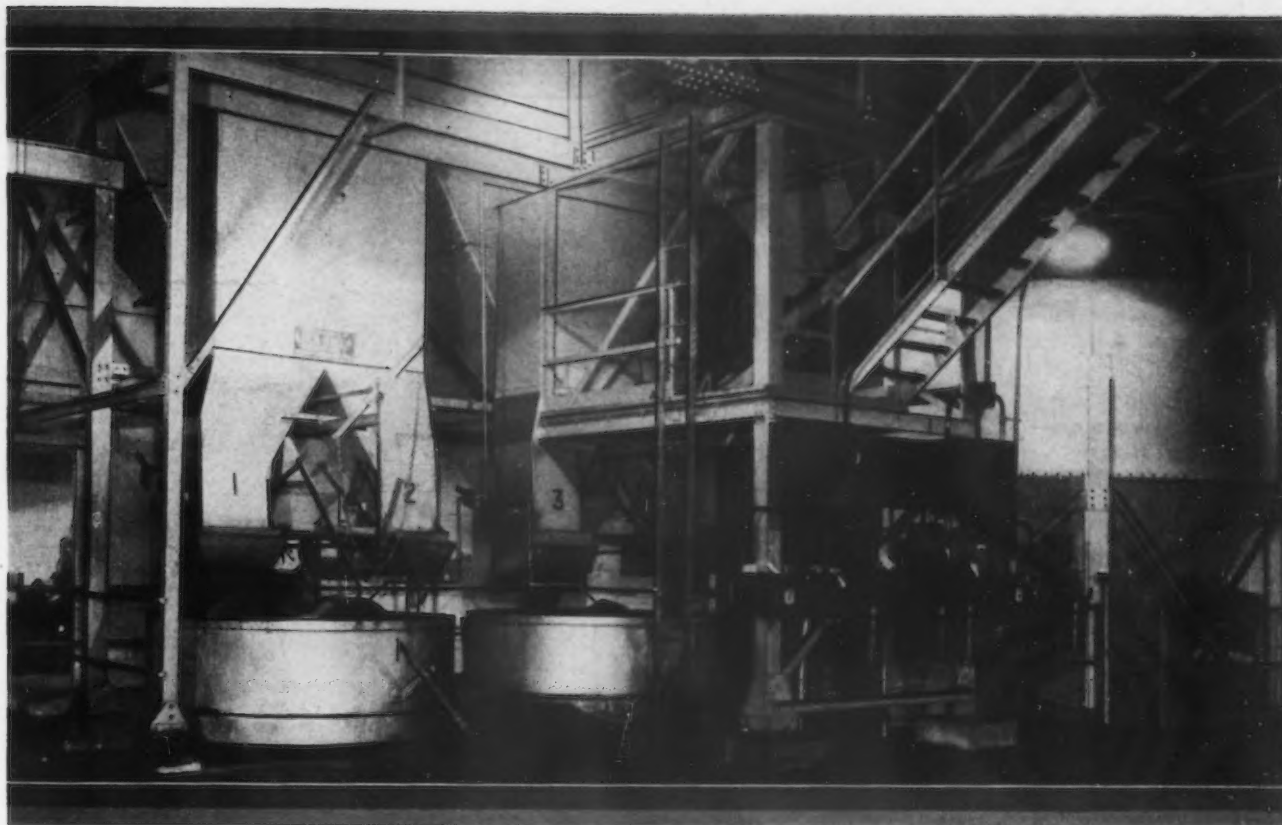


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The scale car carries two charging buckets, spotting each in turn under a hoisting shaft extending to the charging floor. The flanges on the buckets engage a "wish-bone" in the cupola, permitting a gravity drop of the hoisting eye, from which a cone-shaped bottom is suspended.

▼ ▼ ▼





Storage bins for recovered molding sand feed the material to mullers, in which new sand, water and sea coal are added. These discharge the mixture to a belt which delivers it to a bucket elevator. After being raised to another mixer, the sand is discharged into a large storage tank, shown at the right.

tinually into the buckets under the notches, so that the slag breaks up and doesn't adhere to the receptacles. These buckets are periodically removed to a refuse dump in the yard. The yard crane transfers the material from the dump to railroad cars for shipment.

#### "Wishbones" Facilitate Charging

The cupola charging floor is equipped with a 3½-ton Shepard electric crane and charging machine, which is swung on a semi-circular track into position before either cupola. About 15 tons of pig iron, 15 tons of scrap and a proportionate quantity of coke are stored on the charging floor, so that operations may be continued for a time if the crane should temporarily go out of commission. A tumbling barrel, also on this floor, breaks up old brick into dust, discharging into a hopper below. The dust is used for lining ladles.

On one side of the interior of the cupola (at charging door level) is attached an iron bracket, called a "wishbone." The charging machine rests the top flange of the charging bucket on the wishbone, permitting a gravity drop of the hoisting eye, from which a cone-shaped bottom is suspended. This causes the charge to distribute evenly around the sides, instead of dropping in one lump in the middle of the cupola.

#### Cables Eliminate Extra Operative

Cables within reach of the scale car have been attached to the traveling and hoist controls of the charging machine, so that one of the charging men can at-

tach the hoist to the eye of one of the buckets and start it up to the charging floor while the other operative is climbing the stairs. These cables have eliminated the need for an extra man to run the charging machine.

At the charging level the cupola is lined with iron bricks to take the wear of repeated impacts. Fire brick for lining the remainder of the cupola is kept in a storage room immediately adjacent to the melting floor and the raw material yard. The cupolas are patched with firestone instead of mica schist or fire brick.

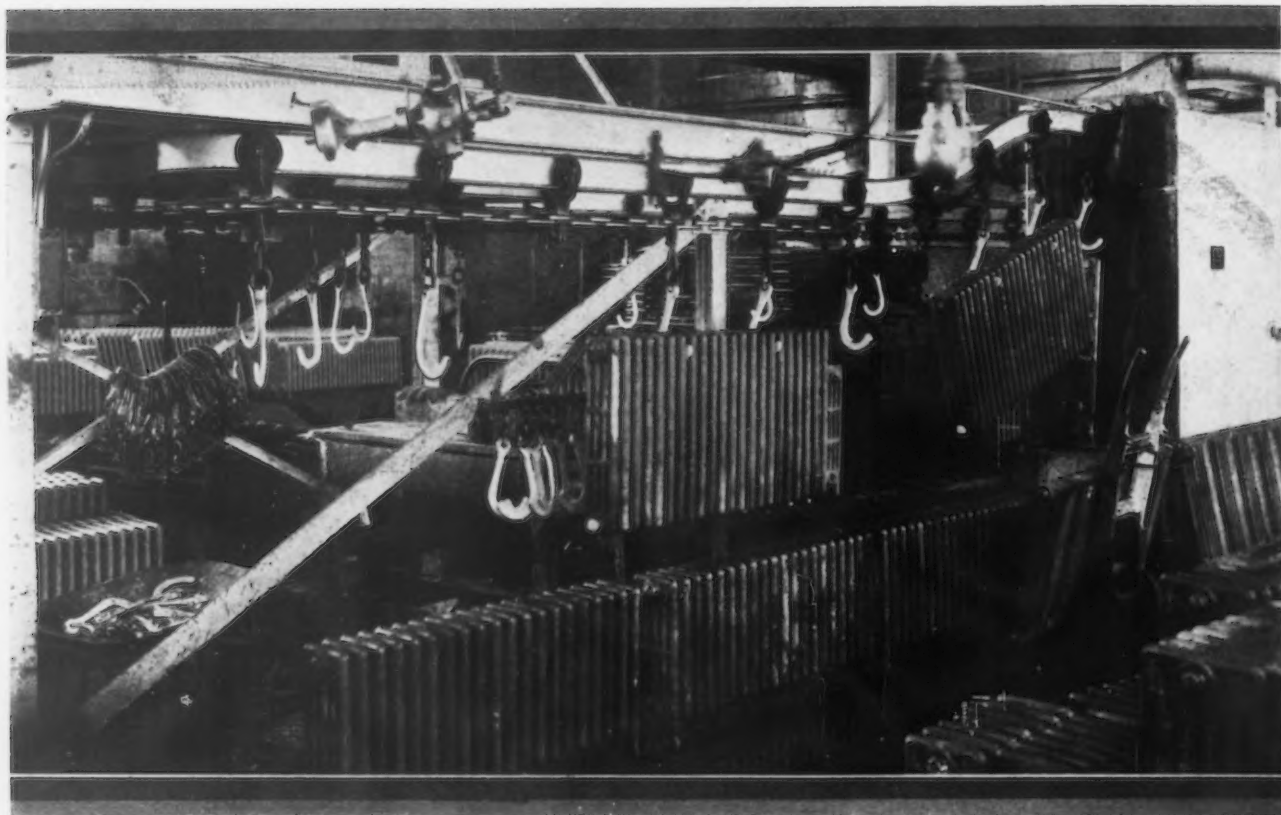
About 45 charges, averaging 2 tons of materials per charge, are run in the cupolas per day of 9 hr. The daily melt of the cupolas (in 9 hr.) is 80 to 90 tons.

#### Core Vent Plate Suspended From Spring

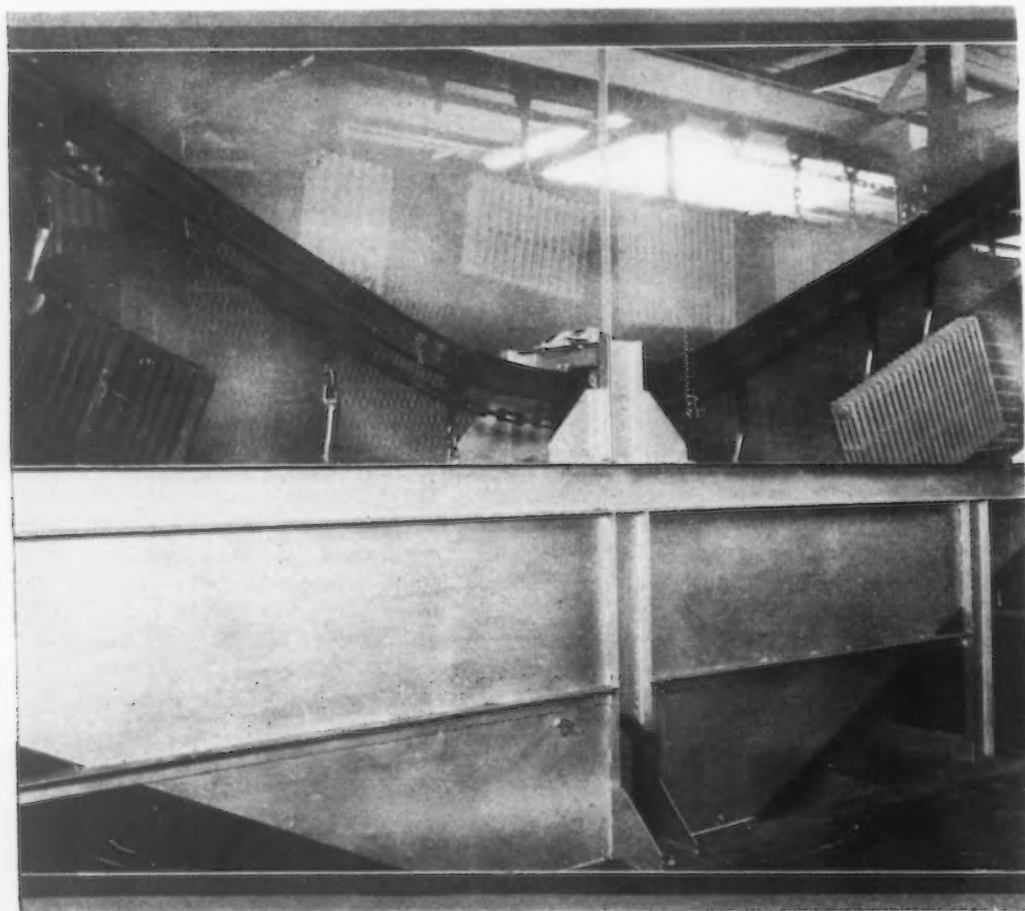
Modern material handling methods also are used in the core department. Core sand is carried by bucket elevator to a riddle and then discharged into a storage bin, with a measuring hopper in the bottom. From the hopper it is released into a mixer, the mouth of which can be lowered for discharge into a wheelbarrow.

Core bond and water are added to the sand in the mixer. The core bond is made of a mixture of linseed oil, crude oil and resin. Resin is boiled in a tank, heated by a light wood fire, located in a separate building.

The melted resin is pumped into another tank,



▲ ▲ ▲ After being assembled, radiators are hooked on a conveyor and carried through a washing machine (shown at extreme right).



▲ ▲ ▲ Following washing, the conveyor carries the radiators through a dip tank, shown in this illustration, and then through a drier. All radiators are given a priming coat of paint.



mixed with linseed and crude oil and pumped to a measuring tank under the core sand mixer.

Core makers' benches are located opposite five double core ovens. A feature of core making is an arrangement that relieves the operative of the necessity of laying down and picking up the vent plate. The plate is suspended from a spring and when the core maker is through with it, it rises up out of the way. Another thing that increases the efficiency of the core maker is an electrically heated plate on which he lays his strike-off. A warm strike-off does a smoother, cleaner job, since the sand will not adhere to it.

#### Cores Pass Through Ovens to Storage

The core racks are on flanged wheeled buggies and are moved on tracks into the core ovens. A transfer track, equipped with turntables, permits the buggies to be switched to any track and later to be turned around if necessary, so that the returned empty core driers are in the handiest position for the core maker.

Each oven takes two buggies on each track, heat being supplied by fuel oil burners under a brick arch in the middle of the chamber. The temperature is raised to 450 deg. F. when the buggies go in and then drops back to 375 deg. (because of the influence of the cold buggies). It then takes about 2 hr. to get the temperature up to 500 deg. on small work and 2½ hr. on large work. The burners are then shut off and the buggies are left in the ovens ¾ hr. longer.

The buggies pass out on the foundry side of the ovens, the cores are removed, and the empties are returned on tracks on either side of the ovens to the transfer and then to the core benches.

A machine files off the rough edges of the cores and they are then brushed and carried by monorail to the molding department.

#### Special Machines Clean Castings

The cleaning room for the castings has special equipment. To knock out the cores the castings are hung on a continuous chain and bumped against knockers on a continuous belt below, which operates in the opposite direction. Dust drops through a grating in the floor and is drawn by suction pipe to a stor-

age bin in the yard. From the bin the dust is discharged into railroad cars.

After the core sand is removed the castings are unhooked from the continuous chain and are slid down a chute to a conveyor which carries them under a wire brush and past an emery wheel, which grinds the edge of the casting. Cleats on the conveyor belt pull the casting past the brush and grinder.

The casting is now turned over and the same operation is repeated under another set of brushes and another grinder, the latter grinding the other edge of the casting. Dust from the emery wheels and brushes is also removed by suction fan.

#### Testing and Assembling

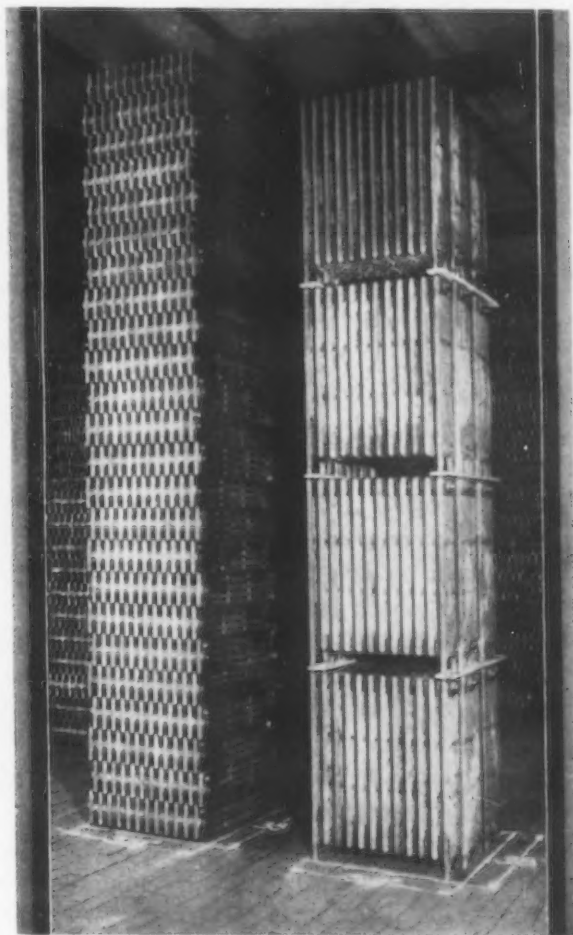
After being cleaned the castings are advanced to the testing and assembling department. In the first test clamps are put on each side of the casting hole and water pressure is turned on up to 110 lb. per square inch. All castings that show leaks are discarded.

In the machining department all gate ends and bottoms of radiator feet are ground and all rough edges between radiator bars are filed. A special combination machine taps and faces the hole of the casting. The holes are tapped on one side with right-hand threads and on the other side with left-hand threads and the nipples used to connect the castings likewise have left- and right-hand threads.

#### Continuous Washing, Painting and Drying of Radiators

No unassembled stock is carried. Consequently, as fast as the castings are machined they are put on assembling machines and then passed by gravity roller conveyor to a second 110-lb. water test. Radiation that passes this test is lifted by pneumatic hoist and ground and buffed on top, following which it is hooked on a continuous chain conveyor and passed into a washing machine, built by the Detroit Sheet Metal Works, Detroit. Here the radiators are subjected to a continuous hot water spray. The spray is hot enough so that the metal is thoroughly dry soon after the radiators have left the machine. They are then passed through a paint dip tank, over a drip pan and into a drying oven, supplied by the Drying Systems, Inc., Chicago. From the drier the radiators are returned

(Concluded on page 1901)



A comparison of the new and old methods of stacking radiators. Stacking on the side conserves warehouse space.



# Precision Forging—the Newer Idea on Drop Forgings

By A. H. DEUTE

General Manager,  
Billings & Spencer Co., Hartford, Conn.



**A**S the manufacture of machinery of every type moves into a new era, an entirely new conception of drop forgings is starting to govern.

The manufacturing era which drew to a close toward the middle and end of 1929 was the era which had its inception during war-time conditions. This was particularly true in the case of the production of drop forgings.

During the war years, the crying need was for quantity production in drop forgings. A great many drop hammers were hurriedly built and put into operation. With the end of the war, this country found itself with a surplus of drop forging equipment, but after 1921 and 1922 the new demand began to make itself felt and, for the next several years, peace time need for drop forgings increased rapidly—so rapidly, in fact, that much additional equipment was installed.

This increase in equipment continued to keep ahead of increased demand—to such an extent, in fact, that data of the Drop Forging Institute indicate that, even during the big years 1928 and 1929, there was more equipment in operation than was needed to supply requirements. As a result, in spite of this enlarged demand for forgings, the entire period of years closing with 1929 witnessed a buyers' market in the forging field.

The inevitable result was a constant hammering down of drop forging prices on the part of buyers. For this the buyer cannot be held responsible, because quotations seemed never, in his experience, to strike bottom. On the other hand, the owner of a battery of hammers felt it important to keep them at work, to "eat up the burden." This resulted in a great studying of methods, followed by marked improvement in production records, so that, even in the face of an

**S**PENDING a little money to save a larger amount is practiced in American industry in a number of ways. One instance which has had a recent expansion has to do with making forgings so closely to dimensions that considerable machining cost is thereby avoided. This costs more for the forging operation, but the net result is reported to be a considerable saving. Such a process is known as precision forging.



over-supply of forging facilities, most shops made a profit.

This steady downward trend in prices, more often than not the result of speeding up methods, has not, it is reasonable to say, tended to make for better forgings.

It was to be expected that during a year such as 1930, from some direction, in some way, there should be a new development in drop forging ideas and re-

quirements. During the spring of 1930, the Billings & Spencer Co., Hartford, began to offer a new type of drop forging, known as "precision" forgings.

Frankly, the "precision" forging is designed to create more business for a drop shop equipped with a liberal supply of hammers, but located in a section which places it at a handicap with reference to the center of drop forging requirements, namely, the automotive market of Detroit. In short, the underlying thought is to produce a forging worth more money.

With the lowering of drop forging prices, as a result of keenly competitive conditions, the freight rate from Hartford to various buying markets proved a serious obstacle in the case of a purely competitive forging. It is axiomatic that in such a case either there must be a further cut in price or such a marked improvement in quality that the buyer enjoys a saving.

The problem confronting the Billings & Spencer Co. was: "How can better forgings be made than have ever been made before? How can the buyer get more value in forgings without ruinous cuts in price?"

And the answer was: "A forging is not a finished product. In the case of many forgings, the forging is just the raw product on which money is spent for machining. Machining often is much more expensive than forging. Is it possible to put five cents more into the raw forging, with the result that ten cents

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This combination center head was forged for the L. S. Starrett Co. It illustrates the superior finish and greater accuracy of the precision forging, against the commercial product.

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will be saved in the machining? That will reduce costs for the buyer, just as will lowered prices for forgings, and in a much sounder manner. It will be trading the drop forging industry up, and not down."

On that premise, the Billings & Spencer Co. went to work. A small but efficient research department got under way. This research department was given valuable support through the very strict requirements on certain airplane forgings which developed at that time.

It so happens, too, that, in the making of Billings & Spencer tools and golf club heads, machining is as much of a factor as forging; so here, in one shop, both problems were in evidence. It was a simple matter to work on machine shop savings through the production of forgings with closer tolerances, and to demonstrate through case and control methods what actually happens when additional forging operations are put into effect to create savings in machining.

Indicative of what was accomplished is the illustration of the golf club forging. Instead of merely trimming and cleaning, additional operations making for much closer tolerances were worked out, and the final illustration pictures the finished forging. While this resulted in an added forging cost of \$2 for a certain lot, it also made it possible to reduce grinding cost by \$4, showing a net saving in the finished parts of \$2. And in addition there is the greater accuracy of loft angle.

In short, there is this thought underlying the pre-

cision forging: That one cent additional used in the forge shop may, in many cases, save two or more cents in machining operations, resulting in a material saving on the total cost of the finished part.

This experimenting has developed many interesting sidelights. For instance, it was evident, at a very early date, that, to meet the close tolerances which were set, new standards of drop hammer quality had to be considered. Drop hammers had to be built which provided greater speed, so that the forging could be completed within the narrowest heat range. Secondly, this called for an all-around better drop hammer construction, to the end that the original forging could be made to the closest possible tolerance.

While precision forging is still in its infancy, this opportunity to work out reductions in cost has been quickly taken up by engineers. It promises much, in the case of the forging on which a great deal of machining is to be done, and especially in the case where very

smooth surfaces are desired.

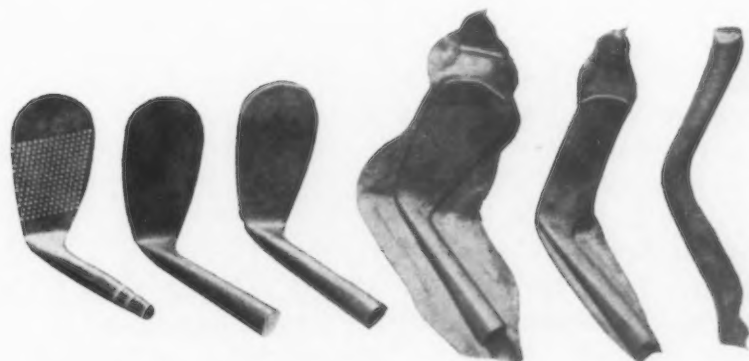
It is already evident that close tolerances, heretofore regarded as merely laboratory demonstrations, are entirely practical in volume production. While this type of forging is of necessity more costly than the rough forging of the past decade, it can, in many instances, show marked savings to the buyer.

Engineers have been quick to see the savings resulting from the elimination of much costly grinding.

(Concluded on page 1902)



A Pratt & Whitney airplane rocker arm; above, the commercial forging; below, the precision forging, which must be so free from surface defects as to pass a microscopic test.



▲ ▲ ▲

Progressive steps in forging a golf club head, from the bar of steel. The fourth figure is the usual forging of commerce. The fifth is a precision forging, set for shape, angles and loft and provided with the semi-finished surface.

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# Cold Rolling of Strip Steel and Its Development

By STEPHEN BADLAM

Consulting Engineer, Pittsburgh

**C**OLD rolling may be defined as working, or shaping, a material by means of rolls, at temperatures below the critical range. In practice, so far as steel is concerned, it is confined to working at approximately atmospheric temperatures, any increase over this being incidental, rather than intentional. The ordinary temperature for cold rolling steel runs from 50 to 250 deg. Fahr.

Between this and the temperature of hot rolling, usually above 1300 deg., though sometimes as low as 900 deg., is a range in which the working of steel is not practiced commercially, and about which we know little. It is not improbable that, in the future, we may find technical applications in this wide, undeveloped field.

## What Is Sought

Cold rolling of strip steel is practiced to secure certain inherent properties in the finished product. These properties may be classified under four heads: Dimensional, or gage; hardness, or temper; surface, or finish; edge.

The dimensional, or gage, factor has two phases: (1) The range of gage that may be produced by cold rolling extends below that which may be produced by hot rolling, where equal widths are considered, with the exception of the pack rolling of sheets. (2) The accuracy of gage of cold-rolled material may be

greater than gage accuracy of hot-rolled material.

All rolling, including cold rolling, affects the dimensions of the metal worked upon in three primary directions. It produces compression in the direction of roll pressure; extension in the direction of rolling; spread in the direction at right angles to the first two directions.

## Difference in Plastic Deformation

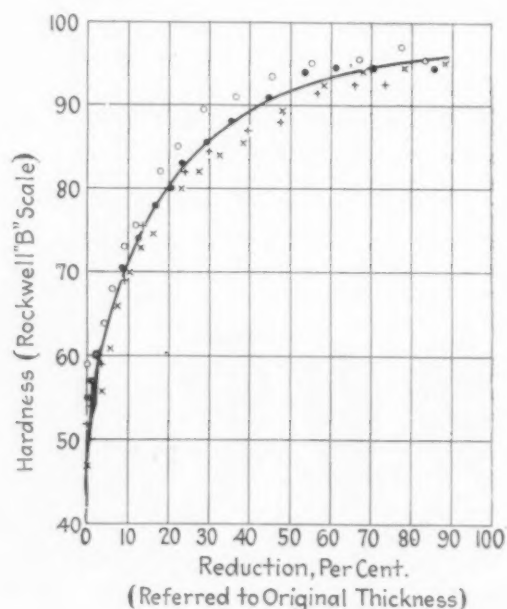
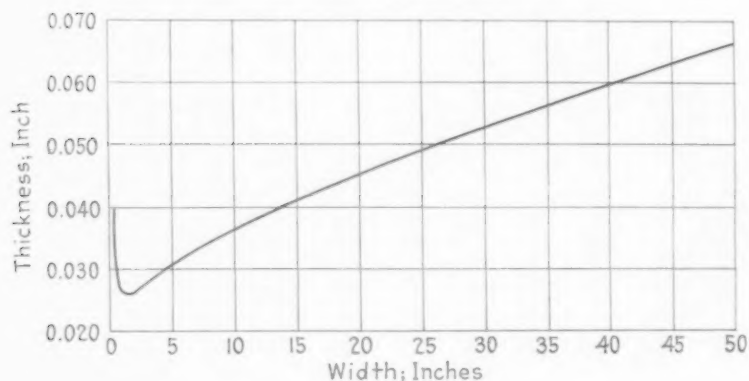
In one respect the plastic deformation of metals in the cold differs considerably, in degree, from that of hot metals.

When pressure is applied to an elastic material, like steel, the material is compressed; but, if the pressure is released, it returns to its original shape; that is, the material is stressed within a zone of elastic deformation. As the pressure is gradually increased, we reach a point where a given pressure causes a permanent change in the condition of the material and it does not return to its original shape; that is, the material is stressed within a zone of inelastic or permanent deformation. The boundary line between the zones of elastic and inelastic deformation, or the critical pressure below which no permanent deformation takes place, is substantially that of the elastic limit of the material.

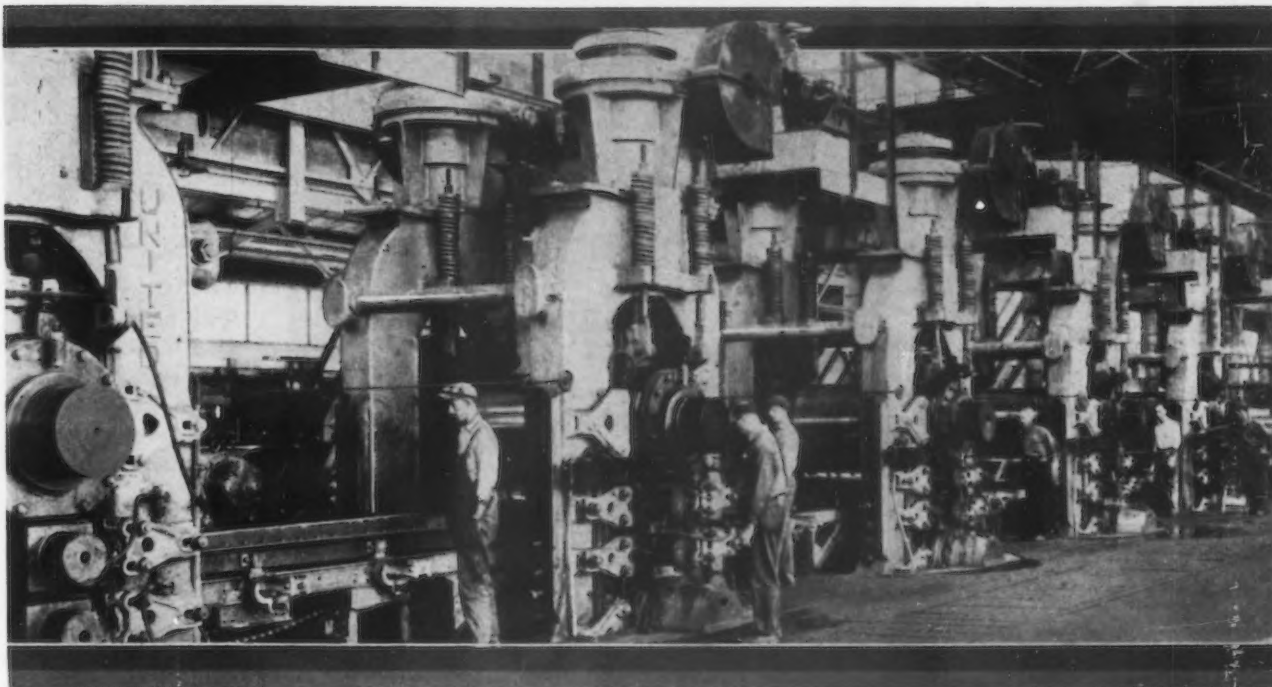
Now, as the temperature of the metal is increased the critical pressure falls rapidly, so that, as far as

Fig. 1—Limiting gages of commercially, hot-rolled steel strip of varying widths.

Fig. 2—Increasing hardness of steel strip, cold rolled, as the work done, and reduction accomplished, goes up







▲ ▲ ▲ Cold-rolling mill in Ashland plant of American Rolling Mill Co., with rolls 14 and 34 in. by 58 in.

hot rolling is concerned, at all usual temperatures and pressures, the metal is being worked within the zone of inelastic deformation.

In the case of cold rolling, on the contrary, the elastic limit increases with the cold working and the critical pressure progressively rises. Hence it becomes more and more difficult to effect permanent deformation. This would seem to indicate two conditions as being possible:

1.—If the spring of the mill and the rolls is so much that the pressure cannot exceed the critical pressure at a given point in the reduction, further reduction in that mill would be impossible.

2.—If the spring of the mill and the rolls is so little that the pressure can exceed the critical pressure, then further reduction, at the same percentage rate, is possible until a new condition of equilibrium is reached.

#### Hardness or Temper

In a general way it is known that, as the amount of cold work is increased, the hardness is correspondingly increased, but that the effect of a given increment of reduction decreases as the total amount of cold work increases.

The relation between the amount of reduction and the hardness produced thereby is shown in Fig. 2. This chart is a composite of four different tests run on material of the same general character (in the range of S. A. E. 1010), but of somewhat different initial sizes, and somewhat different chemical analysis.

**A** VOLUMINOUS paper, well illustrated, on cold rolling of strip steel, which is abstracted in this article, was read before the American Iron and Steel Institute in October. It tells something of the history of the cold-rolling process and what it does from the technological standpoint to the material under treatment. Generally speaking, this means rolling material at temperatures below the critical range. The physical and other effects upon the steel so rolled are set forth in the paper.

The essential characteristic of the cold-rolling process, as far as finish is concerned, is the production of a smooth, bright surface.

As the strip leaves the cleaning room, it has a finish free from oxides or scale, and with a dull matte surface with a gray color. The action of the smooth, hard rolls and the pressure of the cold-rolling mill reduces this dull surface to a smooth, bright condition, and several passes are generally required.

Formerly six to eight passes were considered necessary to produce a regular bright finish. But, with the improvements in hot-rolled finish and improvements in the surface of the rolls, a sufficiently high finish can now be produced with considerably fewer passes, ordinarily from three to five being sufficient. A great deal depends upon the surface conditions of the hot-rolled strip, on the sufficiency of the cleaning process, and on the surface of the cold rolls.

While there is no universally recognized standard of finish the following three grades may be considered as representative: A—Extra bright, variously known as silk finish, satin finish or mirror finish, very smooth and bright, suitable for electroplating and not requiring polishing after forming. B—Standard bright, very smooth, suitable for electroplating and lacquer finishes. C—Regular, smooth and bright, for ordinary work, either left plain or enameled.

[A critical discussion of the steps in the cold-rolling process appears here in the paper.]

Rolling for temper requires



▲ ▲ ▲  
Two-high mill for  
skin rolling strip  
cold up to 48 in. in  
width, giving a re-  
duction of not over  
3 per cent.  
▼ ▼ ▼

a reduction after annealing of from 3 to 50 per cent. For the tempers, as ordinarily defined, approximately the following reductions are required:

For hard temper .....	from 30 to 50 per cent
For half hard .....	from 20 to 40 per cent
For quarter hard .....	from 3 to 15 per cent
For planished .....	under 3 per cent

#### Earliest Historical Records

Undoubtedly the first shaping of metals by rolls was of cold material. One of the earliest uses of the rolling mill was for the production of bars of gold and silver for striking coins and medals. Prior to the introduction of the rolling mill, this had been done by means of hammers, and uniform thickness, which is essential to produce coins of equal weight, could not be obtained in this manner. The records show the use of the rolling mill for this purpose from about 1550.

In the works of Christopher Polhem, who died in 1751, is a description of rolling as it was practiced in Sweden in his time. Polhem was well aware of the fact that small rolls possess more power of stretching the metal than do large ones. He therefore employed "slender" wrought iron rolls, supported above and below by large cast iron ones. The use of cold rolling for polishing iron sheets was known as early as 1747.

For the remainder of the eighteenth century we find much pertaining to the hot rolling of iron, and little to the development of cold rolling, until in 1783 John Westwood of England proposed the cold rolling of iron for the purpose of improving its surface finish (British patent 1398 of Nov. 14, 1783).

#### First Cold Rolling

Cold rolling of iron and steel as an industry may be said to have begun about 1830 as, at that time, we find records of the manufacture and use of steel "reeds" by the weavers of Barmen and Hohenlimburg,

in Germany. These reeds were made of high-carbon steel wire, flattened by cold rolling in exactly the same manner as is practiced in the flat wire industry today. These reeds, as well as watch and clock springs, probably constituted the principal production of that period.

It was at about this same time that the firm of Krupp started the manufacture of hard steel rolls for cold rolling steel.

[Thence the author carries us through the industry, mainly in the United States, dating from 1855, when the Blake & Johnson Co., Waterbury, Conn., received a diploma from the Metropolitan Mechanics Institute, Washington, for its display of a cast steel roll for working silver. The invention of Bernard Lauth, manager of Jones & Laughlins, Pittsburgh, resulted in a patent in 1861 which, as the author states,] gives about as good a description of cold rolling as it would be possible to formulate:

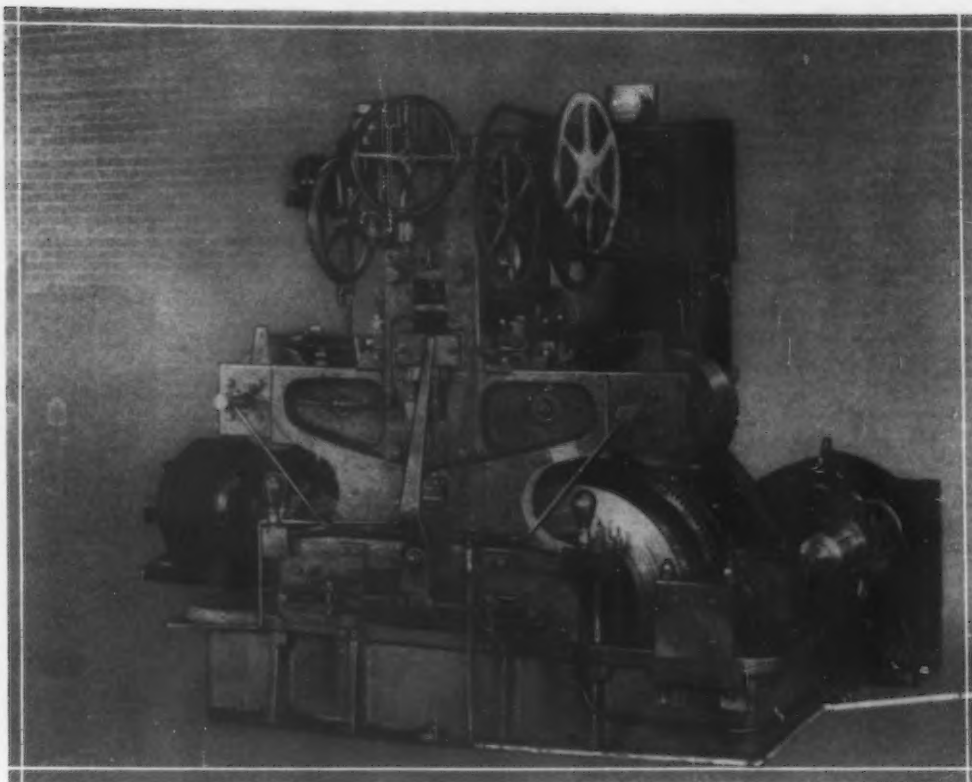
"The process of polishing and finishing rods, bars, sheets or plates of iron and steel, . . . by first removing the scale from the surface of the metal, and then subjecting them to heavy rolling pressure of smooth, cold rolls whereby the fiber of the metal being rolled is packed down and the surface becomes bright and polished."

The process became a distinctly American one and developed into considerable commercial importance, although during recent years, for shapes other than flat, the rolling process has been displaced almost entirely by the cold-drawing process.

[Under "Technical Developments" the author discussed arrangement of mills and their drive and illustrated many mills, both in this country and abroad, to bring out his points. Designs of special mills to perform special functions were described, including the backing-up rolls, cluster mills, the Steckel mill and



▲ ▲ ▲  
 Steckel mill, 2¼ by  
 7½ in. (a small size),  
 which employs ten-  
 sion in connection  
 with cold rolling.  
 ▼ ▼ ▼



others. He paid particular attention to the advantage which, it has been found, attends the use of tension while the strip is being rolled. With proper precautions this has proved of value in obviating need for much annealing between passes, which formerly was required.]

#### *Avoiding Intermediate Annealing*

**D**ISCUSSING the question of the limitations of application of the mill bearing his name, Abram P. Steckel, Youngstown, Ohio, stated that it has found extensive use in a range of gages far above the 0.010 in. thickness mentioned in the paper. Its outstanding application has been in rolling material which is found difficult to cold roll on other mills.

In particular, stainless steels have been handled on this mill successfully without being subjected to intermediate annealing processes, and in gages from 0.020 in. upward. The famous 18 and 8 steel has been rolled on this mill from an initial thickness of 0.080 in. to 0.010 in. without intermediate annealing. This material under such conditions has come out flat (20 in. wide) and has no difference in thickness between center and edge which could be measured within the limits of 0.0001 in.

Besides this, high-carbon strip steel for phonograph springs has been a consistent product, with a gage of 0.022 in. Safety razor blade strips have been rolled on it which, for the Gillette blade, has obviated eight intermediate annealings required by the previous process, and, in another blade, has done away with 13 annealings.

Rolling costs were reported low on this mill because, primarily, of its high speed of operation. The mill will work, Mr. Steckel said, within 5 per cent of gage on an order calling for 0.010 in. thickness. It could get still closer to the gage if a satisfactory means

existed for gaging the moving strip coming from the mill.

#### *Stresses the Importance of Accurate Pickling*

Another speaker referred to an increase in hardening due to aging of steel after it has been cold rolled. He found this increase to be greatest within the 10 days immediately succeeding the rolling operation, with a much slower rate of increase in later days. The gain so experienced ranges from one to nine points on the Rockwell scale.

This speaker pointed out that pickling of steel preliminary to cold rolling is a most important matter and one which has received too little expert attention. Strength and temperature of the pickling bath both are vital to best results, and both will vary according to the character of steel being treated and the results desired.

Considerable difficulty has been found in pickling stainless steel and some of the other alloy steel products, because of difficulty in dissolving the alloy scale adherent to the surfaces of these steels.

One feature making for the success of cold rolling lies in making heavy gage reductions at a slow speed of rolling. This will keep the generation of heat during the process from becoming excessive. One of the greatest improvements in recent years, according to this speaker, is the strong-tension reel or winder mentioned in the paper, whereby the steel is kept pulled away from the rolls under a considerable stress, and the necessity for intermediate annealing thereby avoided.

#### *On the Thorny Price Structure*

Comment on the price situation carried in the original paper was stressed by this speaker. He stated that the automobile plants, through the medium of large tonnage contracts, have been able to get low



prices for the strip steel which they purchase.

These prices have been far below the corresponding earlier prices for strip steel of similar quality, used in smaller quantities and considered in earlier days as more or less of a specialty. Nevertheless, these quotations have received currency as being the market figure for the material, and the industry is reported to have suffered therefrom in an economic way.

### New Device Tests Machinability

WHAT appears to be a new method of testing the machinability of a metal is described by A. Wallich and K. Krekeler in *Archiv Eisenhuettenwesen* for July, 1930, pages 41 to 43, entitled "Testing of Machinability by Means of the Leyen-setter Pendulum."

Briefly, a cutting tool, sharpened and in good condition, is fixed in a holder on the end of a pendulum and is allowed to swing through an arc of 15 deg. on to the surface of the material to be tested. The point of suspension of the pendulum is adjusted to cause the tool-cutting edge to take a small cut, say  $\frac{1}{4}$  in. deep. The tool and holder are again transferred to the pendulum and released to fall through the same arc as before. The blunted tool will not cut so deeply as before, but the back thrust up the pendulum rod causes the point of suspension to rise. This suspension is carried on the end of a lever called the secondary pendulum, and the rise of this lever from its horizontal position is registered on a dial, thus giving a measure of the extent to which the tool has been blunted.

Uniform results were obtained with a tool steel of the composition: Carbon 1.4, chromium 0.7, vanadium 0.2, tungsten, 5 per cent, and it is proposed to use this material as a standard for comparison. So far, however, other tool steels have not given any good uniformity of results obtained by readings of the back thrust of the pendulum.

### Ferrochromium Refined in Coreless Induction Furnace

PROPOS of the increasing demand for rustless steel and the necessity for using a low-carbon ferrochromium in its production is a discussion by C. Tama of "The Refining of Ferrochromium in the Coreless Induction Furnace," in *Archiv Eisenhuettenwesen* for August, 1930, pages 55 to 61.

Concerning the chemistry of the process of decarburizing ferrochromium not much is known, he says, owing to the difficulty of obtaining apparatus with entirely carbon-free linings in which to conduct systematic melting experiments. He has carried out trials

in ironless induction furnaces constructed by Hirsch Kupfer-und Messingwerke, A. G., in the design of which modifications had been made for the better control of the eddyding of the bath due to the pinch effect.

The furnace linings were of dry, loose, easily sintering refractory materials, rammed in between the induction coil and a sheet iron template in the form of close-ended cylinder to mold the crucible. On heating, this template melts away and the refractory material behind it becomes fritted to a hard mass which then forms the actual crucible.

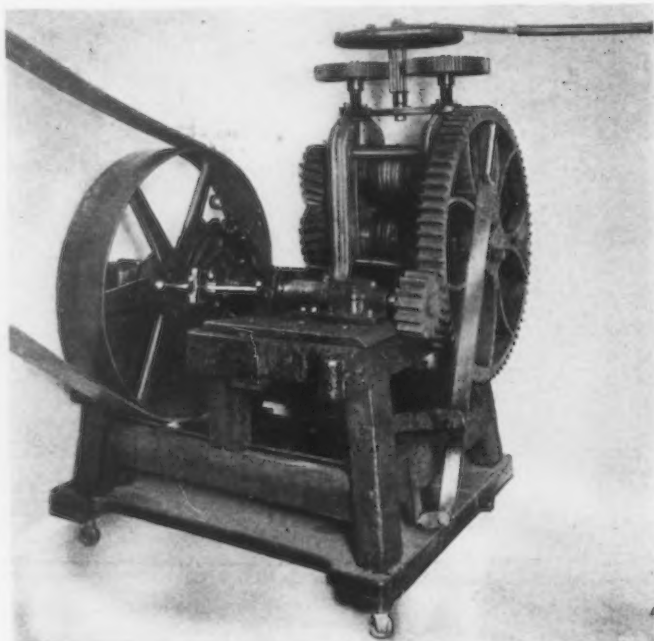
Magnesia, prepared in the electric furnace and containing 96 per cent  $MgO$ , with a zirconia backing withstood the slag well. In the refining operations, various oxide containers were used, particularly oxides of iron, copper, chromium and calcium, or mixtures of these with silicate and magnesite additions. Copper rolling mill scale proved very satisfactory.

The charges were for the most part 400 lb. in weight, consisting of ferrochrome, with chromium ranging from 63.5 to 33.5 per cent. The carbon at the beginning was from 4.2 to 6.8 per cent, and at the end it was from 1.0 to 1.5 per cent, and the refining was completed in from about 90 min. up to 150 min. The operation of refining in a high-frequency induction furnace is much simpler and more easily effected than in an arc furnace, he holds.

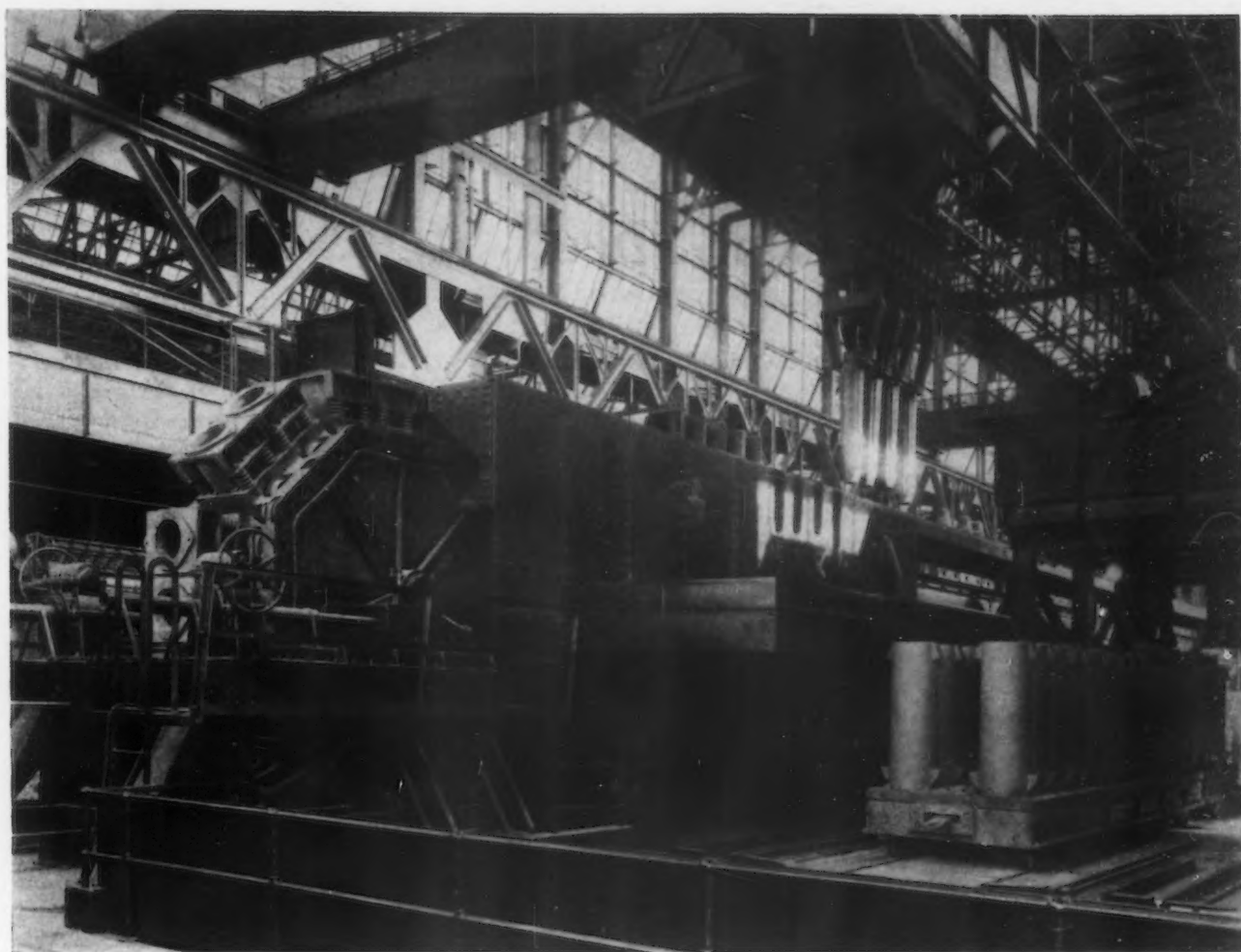
### X-Rays for Testing Die Castings

Aluminum die castings have been examined for porosity by means of X-rays and subjected to tensile tests, and the results are discussed by L. Frommer, W. Kuntze and G. Sachs in an article in *Zeitschrift Verein deutsche Ingenieure*, Vol. 73, pages 1609 to 1612.

According to the authors the tendency to break near the fillets was found to be the cause of greater variations in strength than the presence of pores. A number of specimens were cast in such a manner that they contained abnormally large pores. By suitable reduction of the specimen diameter, fracture was obtainable in the desired location. The pores decreased the tensile strength in proportion to the decrease of actual cross section. No additional "notch" effect could be observed.



Early cold-rolling mill with geared drive, dating from 1880 or before, which was brought into use during the World War to roll stream-line wire for airplanes.



CONVEYOR  
TAKES  
INGOTS  
FROM  
MOLDS  
TO SOAKING  
PITS



LARGE enough to handle 250 ingots at one time, a conveyor has been placed in operation in the soaking pit department of the Rouge plant of the Ford Motor Co., Dearborn, Mich. To keep it adequately supplied a special electric crane equipment lifts four ingots simultaneously and puts them in the conveyor. Developed by Ford engineers, the conveyor and quadruple lifting machinery are unique in steel plant practice.

Special Ford-type fluted steel ingots are cast in the cylinder-like molds which have corrugated interiors and taper slightly toward the bottom. The practice heretofore was to let the ingots stand in the mold until needed. Now the conveyor system is used, representing an application of the mass production idea of automobile assembly applied to handling ingots.

Ford engineers designed and erected, parallel to the mold train track, an endless conveyor 500 ft. long and 16 ft. high. At each end are huge sprocket wheels and extending across the top is a track connecting with the driving gear near the tops of the two wheels; a similar track connects in the same manner near the bottom of the wheels. Thus the conveyor travels a somewhat elliptical course. The chain or steel belt of the conveyor supports a number of two-pot receptacles, each pot of sufficient size and depth to hold an ingot in an upright position.

Serving the conveyor is a 10-ton electric overhead stripper crane with four tongs, which lifts four ingots simultaneously from the molds and deposits them in conveyor pots. Three electric cranes are still retained at points convenient to the 36 soaking pits, to lift the ingots from the conveyor into the pits.

Since each ingot carried by the conveyor weighs 1720 lb., the danger of breaking the pots is minimized by cradling each pot on four spiral springs. To achieve smoothness of operation and lower costs, the conveyor is equipped with roller bearings. It is electrically driven and is capable of transporting more than 400,000 lb. of ingots at one time.

# Effect of Heat Treatments on Efficiency of High-Speed Steels

By DR. ERDMANN KOTHNY

Prague, Czechoslovakia

OPINIONS still vary with regard to the influence of tempering hardened high-speed steel tools at temperatures ranging from 580 to 600 deg. C. For this reason, it appeared advisable to carry out further tests to determine the influence of tempering on the cutting efficiency of such steels.

While the advantage of hardening high-speed steel at high temperatures is generally conceded, opinions still differ as to the value of tempering hardened tools of high-speed steel. Thus Hohage and Grützner take the view that it is not absolutely necessary to temper high-speed steel as a tempering will take place under normal working conditions, especially if soft steel is machined. French, Strauss and Digges have also been able to establish only small changes in the cutting efficiency if the steel is tempered at 600 deg. C. Their lathe tests were made on 3 per cent nickel steel having a tensile of 64 to 83 kg. (91,000 to 118,000 lb. per sq. in.). Oertel and Pölguter contend, with regard to high alloyed steels, that the influence of tempering on the cutting efficiency decreases as the percentage of alloying metals rises. D'Arcambal is so far the only one that has published actual figures on the increase of the cutting efficiency by tempering. It is evident that opinions still differ very much as to the value of tempering hardened high-speed steels, and, for this reason, new tests were carried out with a view:

(1) To test the correctness of Oertel and Pölguter's contention that the effect of tempering on the cutting efficiency diminishes as the alloy percentage rises,

(2) To determine the influence of tempering when different hardening temperatures are used, and

(3) To prove the influence of tempering when machining very hard and medium hard steel.

As no melting plant of our own was at disposal the tests were carried out with high-speed steels of the Poldi Steel Works. They were purchased from the sales office of these steel works without indicating the purpose for which they were required. Table II shows their composition. These are all electric steels melted in a one-groove induction furnace. The simplicity and uniformity in working these electric furnaces are a guarantee for the utmost uniformity of the various heats made. Of course, high-speed steels of uniform quality can also be made in arc furnaces if the heats are properly melted.

The steels were supplied 14 mm. sq. They are made of small ingots which had solidified rapidly and uniformly. They had been worked down hot to a very considerable degree and, consequently, the carbide grains were evenly distributed in the annealed bars. From the bars standard lathe tools were made. Fig. 5 shows their shape and the way they were set during the turning tests.

Of each brand one bar was used to make 12 turning tools. The cutting edges of every two tools were forged on that side where the cut had been made, and each such pair was hardened at the same temperature. The following temperatures were used in hardening: 1200, 1225, 1250, 1275, 1300 and 1325 deg. C. At 1200 deg. C. polyhedral structure commences to form in hardening the steels employed while 1325 deg. C. represents approximately the highest temperature at which no trace of overheating can yet be found.

The tools were heated to hardening temperature in an electric salt bath furnace, the temperature being controlled by a platinum-platinorhodium thermocouple. Before dipping the steels in a salt bath they were preheated in a muffle furnace up to 900 deg. C. The tools

TABLE I.—ANALYSIS OF HIGH-SPEED STEELS AND RESULTS OF TESTS CARRIED OUT TO SHOW INFLUENCE OF TEMPERING ON THEIR RETENTION OF CUTTING EDGE (D'ARCAMBAL)

Steel	C Per Cent	Mn Per Cent	Si Per Cent	Cr Per Cent	W Per Cent	V Per Cent	Co Per Cent	Mo Per Cent	Work done in cutting (in meters)		Increase of output by tempering	Test conditions Work piece Ni-Cr Steel 89 kg. per sq. mm., cutting speed 39.7 mm. per min., depth of cut 3.2 mm.
									Hardened in oil at 1200 deg. C.	Hardened at 1260 deg. C. and tempered at 595 deg. C.		
1	0.70	0.21	0.31	4.45	12.65	1.18	.....	.....	2.24	3.94	176	
2	0.89	0.25	0.14	3.57	14.70	1.75	.....	.....	3.35	5.44	162	
3	0.62	0.22	0.14	4.14	17.84	0.26	.....	.....	1.70	5.49	323	
4	0.62	0.34	0.09	3.74	17.87	0.55	.....	.....	1.22	3.94	323	
5	0.70	0.18	0.13	3.43	17.56	0.68	.....	.....	1.32	3.65	234	
6	0.67	0.30	0.11	3.66	17.39	0.95	.....	.....	1.50	4.62	318	
7	0.68	0.30	0.22	3.68	17.51	0.97	3.27	.....	2.70	4.65	172	
8	0.70	0.18	0.41	4.43	.....	.....	5.25	4.90	0.30	1.65	550	



were kept 2 min. at the hardening temperature and then quenched in oil. The hardness, and consequently also the cutting efficiency, of a turning tool depend not only on the temperature itself but also on the time it has been kept at same. To get correct comparative figures the tools, made of various brands and hardened at different temperatures, had to be kept at hardening temperature for the same length of time. A

period of 2 min. was chosen as it had been found that, if the steel were held longer at the highest hardening temperature, it got overheated. Figs. 6 and 7 show this clearly, both representing the structure of steel B after hardening at 1325 deg. C., the piece shown in Fig. 6 having been held 2 min. and that in Fig. 7 having been held 4 min. at the hardening temperature. Fig. 7 shows clearly the formation of a ledeburitic network (structure of castings).

Of the turning tools which were made of the same brand and had been hardened at the same temperature, one was tested immediately after grinding while the other was given a tempering (before grinding) in a lead bath for 4 min. at 590 deg. C. This temperature does not cause the maximum increase of hardness after tempering (the maximum being reached at 610-620 deg. C.), yet it was not thought advisable to go to the farthest limit in tempering for an accidental overstepping of the limit of 620 deg. C. might have caused a softening of the tools, and consequently a temperature 20 to 30 deg. C. below the maximum was chosen for tempering.

The turning tests were carried out on a one-plate center lathe of the Zimmermann Werke A. G., Chemnitz, the pitch of centers being 420 mm. and permitting to turn for a length of 2500 mm. It has 8 speeds without countershaft and 8 speeds with countershaft. In addition, the speed can be regulated between these two grades by means of a belt pulley consisting of a pair of conical iron drums. The lathe is driven by an electric motor of 9 hp. For the tests in question shafts of 220 to 280 mm. dia. and 1500 mm. length were used to work upon. They were made of a chrome steel having the

▲ ▲ ▲

**T**HE cutting efficiency of high-speed steels, working on hard and medium-hard steels, can be considerably increased by tempering at 590 deg. C. Such is the claim of Dr. Kothny, in Maschinenbau, from which the accompanying article has been taken. The investigations cover also the influence of tempering at 350 deg. C.

▼ ▼ ▼

composition as given in the following:

C 1.0 per cent, Mn 0.30 per cent, Si 0.25 per cent, Cr 1.4 per cent, P and S < 0.20 per cent.

The structure of all the work pieces had been made uniform by annealing. They showed after heat treatment the following Brinell tensile figures: 111-144, 120-122, 120-125 kg. per sq. mm. The Brinell tensile was determined on various sides of the work pieces, the whole length of same being

tested. The figures given represent the limits of the figures found. From the work piece having a tensile of 111-114 kg. per sq. mm. a test piece 15 mm. dia. by 150 mm. length between gage points was taken and subjected to a pulling test which gave the following figures:

Yield point 47.8 kg. per sq. mm., tensile strength 106.7 kg. per sq. mm. (68,000 lb. and 151,700 lb. per sq. in.), elongation 7.1 per cent, reduction of area 28.6 per cent.

The tools made of one and the same brand and hardened at the same temperature, one of which had been tempered, were always tested in succession. So as not to extend the time of cutting too much in the case of the high alloyed steels (it was not a trial of one brand against another one), the cutting speed was raised as the percentage of the alloying elements increased. It was kept as high as to make the tools of the various brands cut approximately the same time.

When the tools gave out they were re-ground and tested again. The results of these tests are shown in Table III, the figures representing the average of both tests. In Table III, the cutting capacity (average figures) of the tools hardened at different temperatures (but not tempered) is compared to the cutting capacity of hardened and tempered tools of the same brand. Table III. also shows the ratio of the capacities of the tools made of same brand hardened at different temperatures.

The capacity of the tool of each brand which has been hardened at the highest temperature, is assumed to be 100. The table shows, in addition, data on the ratio of cutting capacity of hardened (but not tempered) tools to that of hardened and tempered tools of the same brand and temperature grade, the capacity of the hard-

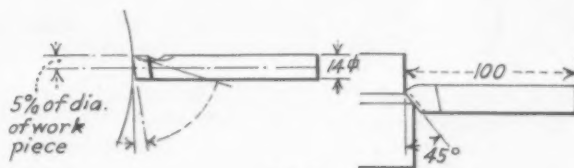


FIG. 5

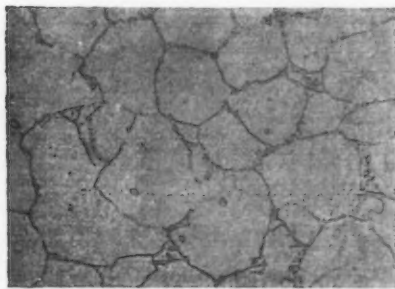


FIG. 6

Fig. 5.—Details of the shape and manner of setting the tools for turning the tests.

Figs. 6 and 7.—Influence on the microstructure of length of time of keeping at hardening temperature. Left—300 dia., held for 2 min. at 1325 deg. C. and quenched in oil. Right—300 dia., held for 4 min. at 1325 deg., and etched with 1 per cent alcoholic nitric acid.

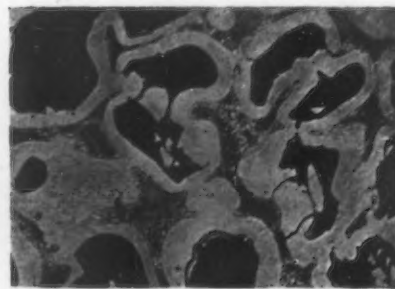
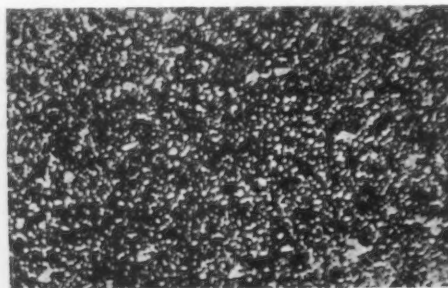
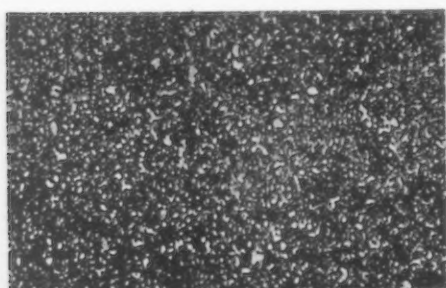


FIG. 7

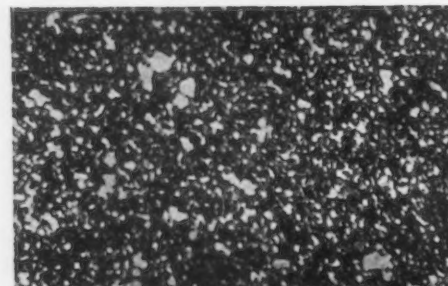
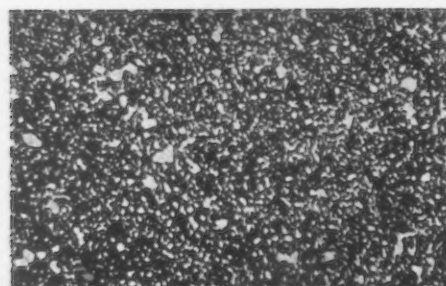
TABLE II.—ANALYSIS OF HIGH-SPEED STEELS TESTED

Designation	Steel brand	C	Mn	Si	Cr	W	Mo	V	Co
A	000* Extra	0.69	0.15	0.26	3.9	14.5	0.59	0.26	.....
B	Maximum	0.74	0.12	0.22	4.0	18.3	0.63	0.66	.....
C	Maximum special	0.71	0.04	0.25	4.5	18.2	0.72	1.28	.....
D	Maximum special*	0.73	0.09	0.27	4.6	18.6	0.69	1.25	4.7
E	Poldi MK	0.76	0.09	0.36	4.5	18.0	0.75	1.37	10.3

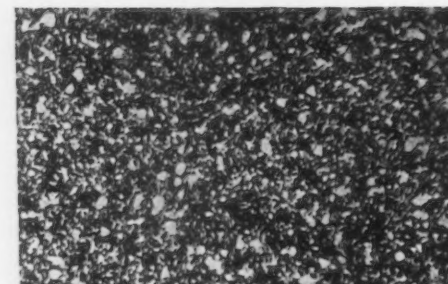
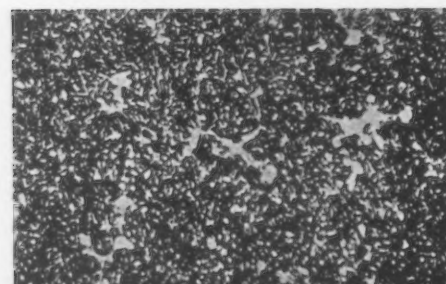


## TREATMENT:

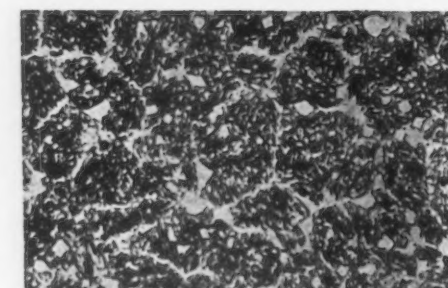
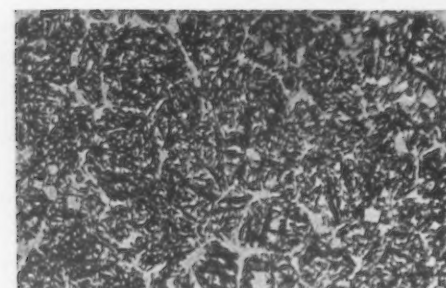
Hardened in oil at 1200 deg. C. and tempered at 590 deg. C. for 4 min.



Hardened in oil at 1275 deg. C. and tempered at 590 deg. C. for 4 min.



Hardened in oil at 1300 deg. C. and tempered at 590 deg. C. for 4 min.



Hardened in oil at 1325 deg. C. and tempered at 590 deg. C. for 4 min.

Figs. 23 to 30.—Poldi high-speed steels A and E, forged, hardened and tempered; etched with 1 per cent alcoholic nitric acid, 300 dia.

TABLE IV.—APPEARANCE OF FRACTURE AND BEHAVIOR OF TURNING TOOLS WHEN TOUCHED BY A FILE

Hardening Temperature	000* Extra		Maximum		Maximum-Special		Max.-Spec.*		MK	
	Hardened	Hardened and tempered	Hardened	Hardened and tempered	Hardened	Hardened and tempered	Hardened	Hardened and tempered	Hardened	Hardened and tempered
1200	Fine grained, glass hard	Fine grained, file bites	Fine grained, glass hard	Fine grained, file bites	Fine grained, file drags	Fine grained, file bites	Fine grained, glass hard	Fine grained, file drags	Fine grained, file bites	Fine grained, file bites
1225	Fine grained, glass hard	Fine grained, file drags	Fine grained, glass hard	Fine grained, file drags	Fine grained, glass hard	Fine grained, file drags	Fine grained, glass hard	Fine grained, glass hard	Fine grained, file drags	Fine grained, file drags
1250	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, file drags	Fine grained, file drags
1275	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard
1300	Glittering spots, glass hard	Glittering spots, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard	Fine grained, glass hard
1325	Overheated, coarse grain, glass hard	Overheated, coarse grain, glass hard	Overheated, glass hard	Overheated, glass hard	Slightly overheated, glass hard	Slightly overheated, glass hard	Slightly overheated, glass hard	Slightly overheated, glass hard	Slightly overheated, glass hard	Slightly overheated, glass hard



TABLE III.—TIME OF TURNING IN THE HARDENED AND IN THE HARDENED-TEMPERED CONDITION.  
DEPTH OF CUT, 4 MM. FEED, 1.5.

Brand	Test Conditions		Condition of Turning Tool	Hardening Temperature in Deg. C.	Time of Turning and Ratio					
	Brinell Tensile of Work Piece in kg. per sq. mm.	Cutting Speed m. per min.			1200	1225	1250	1275	1300	1325
000* Extra	111-114	8	Hardened and tempered	Time of turning ratio <sup>1</sup>	4.75	4.5	5	8.5	12	16
				Time of turning ratio <sup>2</sup>	2.7	27.3	31.2	53.6	75.4	100
				Time of turning ratio <sup>3</sup>	6.5	7	9	10	20	4
Maximum	111-114	8.5	Hardened and tempered	Time of turning ratio <sup>1</sup>	1.7	156	180	117	167	214
				Time of turning ratio <sup>2</sup>	4.5	5	5.5	6.75	10	15.5
				Time of turning ratio <sup>3</sup>	29.0	32.3	35.5	43.5	64.5	100
Max-Spec.	120-125	9	Hardened and tempered	Time of turning ratio <sup>1</sup>	6	8	7.75	10	12	21
				Time of turning ratio <sup>2</sup>	111	139	190	210	162	218
				Time of turning ratio <sup>3</sup>	3.6	4.3	4.75	5.7	10.5	13.75
Max-Spec.*	120-125	9.5	Hardened and tempered	Time of turning ratio <sup>1</sup>	26.2	31.8	34.5	41.3	76.1	100
				Time of turning ratio <sup>2</sup>	4	6	9	12	17	30
				Time of turning ratio <sup>3</sup>	111	139	190	210	162	218
Poldi MK	120-122	10	Hardened and tempered	Time of turning ratio <sup>1</sup>	3	5	6.5	7.25	10.25	15
				Time of turning ratio <sup>2</sup>	20	33.3	43.4	48.3	68.3	100
				Time of turning ratio <sup>3</sup>	3.5	7	9.5	12	14	26
				Time of turning ratio <sup>1</sup>	116	140	140	165	137	173
				Time of turning ratio <sup>2</sup>	5.5	7.5	11	21.3	27	41.5
				Time of turning ratio <sup>3</sup>	13.2	18.1	26.5	51.3	65.0	100
				Time of turning ratio <sup>1</sup>	9.5	13.5	10	29.9	43	58.5
				Time of turning ratio <sup>2</sup>	172	180	145	135	15.3	140

<sup>1</sup>In proportion to turning time at highest hardening temperature.

<sup>2</sup>In proportion to turning time at highest hardening temperature but not tempered.

ened (but not tempered) tools of each brand and temperature grade being assumed as 100. The tables confirm the test results obtained by the above-mentioned investigators with regard to the influence of hardening temperature on the cutting capacity of high-speed steels. They show that the cutting capacity of each of the brands tested rapidly decreases as the hardening temperature is lowered. The course of the decrease of cutting capacity is about the same with all brands, Poldi MK being excepted as with this the capacity decreases more rapidly than with the other brands when the hardening is carried out at temperatures below 1275 deg. C. This is due to the fact that, with this brand, the polyhedral structure is very indistinct or small at hardening temperatures ranging from 1200 to 1250 deg. C.

As regards the influence of tempering on the cutting capacity of high-speed steels, hardened at various temperatures, the tests proved that, if tempered at 590 deg. C., all the tools hardened at various temperatures were capable of turning for a considerably longer time than otherwise, the work pieces being made of steels of high tensile strength. The increase in the cutting time varies with the different brands, it being in the case of high-speed steel of highest alloy, comparatively lower than in the case of the lower alloyed steels. This tallies with Pölguter and Oertel's

assertion that the influence of tempering decreases as the percentage of alloying elements rises.

The fractures and microstructures of all tested tools were also examined. As reports which permit of comparisons of structures of high-speed steels of varying composition have been seldom published, data on this matter are also given. Table IV contains a description of the fractures of the heat-treated cutting edges of turning tools as well as their behavior when touched by a file.

The table shows that, when hardened at highest hardening temperature, the velvet-like fine-grained fracture of all brands is replaced by a somewhat coarser fracture which may be termed already as overheated. With the lower alloyed steels the fracture shows somewhat coarser than in the case of the higher alloyed steels. With none of the brands can the reformation of the casting structure be traced at the highest hardening temperature. For this reason, the fracture of the tools hardened at that temperature cannot be considered yet as overheated.

This is also proved by the cutting capacity of the tools which, at that temperature, stands at its highest: The photomicrographs show that, with rising percentages of alloying elements, the coarse polyhedral structure appears only at higher hardening temperatures. The microstructure of the hardened and tem-

TABLE V.—TIME OF TURNING IN HARDENED (UNTEMPERED) AND HARDENED AND TEMPERED CONDITION. TENSILE STRENGTH OF WORK PIECE: 70 Kg. PER SQ. MM. (AVERAGE OF EVERY 3 TURNING TESTS).

Brand	000* Extra		Maximum		Maximum Spec.		Maximum Spec.*		Poldi MK	
Condition	Hardened only	Hardened and temp.	Hardened only	Hardened and temp.	Hardened only	Hardened and temp.	Hardened only	Hardened and temp.	Hardened only	Hardened and temp.
Time of turning, in min.	4.11	7.4	8.26	13.07	11.90	23.00	18.1	26.70	16	25
Ratio	100	180	100	157	100	193	100	147	100	157
Cutting Speed	20 m. per min.									
Cross Section of Cutting	Depth of Cut 4 mm. Feed, 14 mm.									
Shape of Tool	Angles 6 deg. x 60 deg. x 45 deg.									

TABLE VI.—CUTTING CAPACITY OF HARDENED MAXIMUM SPECIAL TOOLS WHICH HAD RECEIVED VARYING HEAT TREATMENT

Treatment		Work done in cutting material, of 94 kg. per sq. mm. tensile, cutting speed 13 m. per min., depth of cut, 5 mm. Feed, 1.5 mm.
Hardening Temperature and Hardening Medium	Tempered at	
1300 deg. C. in oil	.....	26.5
1300 deg. C. in oil	350 deg.	20.5
1300 deg. C. in oil	590 deg.	33.5



pered tools is almost identical for all steels at the various grades of hardening. This is proved by Figs. 23 to 30 showing microstructure of hardened and tempered turning tools of Brands A and E. It is martensitic, the martensite becoming coarser as the hardening temperature rises.

In order to find out whether tempering has any influence on the cutting capacity of hardened turning tools when machining steels of lower tensile, the tests were repeated on a work piece of medium hard steel, the same brands being tested but only tools being used which had been hardened at highest temperature. The tests were carried out on a shaft of 300 mm. dia. and 2 m. length, made of unalloyed steel of 70 kg. per sq. mm. tensile strength. The shaft had been normalized at 850 deg. C. and annealed for 2 hr. at 650 deg. C. After annealing it was left to cool down in the furnace. The steel had the following composition:

C 0.56 per cent, Mn 0.8 per cent, Si 0.31 per cent, P 0.018 per cent, S 0.023 per cent.

Table V shows the average results of three turning tests carried out with the same tools which had been hardened, re-ground and finally re-hardened. They show that the cutting capacity is increased in tempering also in the case of tools working on steel of 70 kg. per sq. mm. tensile strength, the increase being about the same as when machining steel of a tensile of 110 to 120 kg. per sq. mm.

Many experts do not advise tempering as both the

tempering at too high a temperature (above 620 deg. C.) and tempering at too low a temperature (300 to 550 deg. C.) cause a decrease of hardness. No reports have so far been published on investigations made with a view to determining the variations in the cutting capacity of turning tools tempered at temperatures ranging from 300 to 550 deg. C. As such tests have been made previously with Brand Maximum Special the results are given herewith. The tests were carried out on a work piece of 1 per cent chrome steel having a tensile of 94 kg. per sq. mm. This shaft had also been normalized. Cutting speed was 13 m. per min., depth of cut 5 mm. and feed 1.5 mm. per revol. Table VI shows the heat treatment of tools and results obtained. Tempered at 350 deg. C. the hardened tools show a slight decrease in cutting capacity. The tempering at this temperature has, however, not decreased the cutting efficiency of the hardened tools to such an extent that the advisability of tempering may be questioned although the hardness of the hardened tools is at its lowest when tempered at the above temperature.

The above results prove that the cutting efficiency of high-speed steel tools, working hard and medium hard steels, can be considerably increased through tempering at 590 deg. C., and, for this reason, tempering is advisable. Of course, suitable equipment for this heat treatment, viz., a lead or salt bath furnace, the temperature of which may be checked by means of a gaged thermocouple, should be available.

### New Aluminum Alloys Have Special Properties

Although the alloy Aldrey has already been used to a great extent as conductor metal in the electrical industry, there is a possibility that the new alloys, Avional and Anticorodal, may be used to a still greater extent, according to an article, "Aluminum Alloys," in *Aluminum*, Aug. 31. These heat-treatable aluminum alloys contain different hardening elements and have considerably higher tensile properties as compared with pure aluminum. These properties are obtained by a combined mechanical and thermal treatment.

The alloy Avional, which is especially suitable for aircraft construction, contains about 4 per cent copper and  $\frac{1}{2}$  per cent each of the elements manganese, magnesium and silicon. The alloy Anticorodal, which is particularly applicable for general structural purposes, contains 1 per cent silicon,  $\frac{1}{2}$  per cent magnesium, and  $\frac{1}{2}$  per cent manganese. Avional is used especially in those cases where high tensile strength and elongation are required. Anticorodal, on the other hand, is used where high bending properties and corrosion resistance are required.

The heat treatment of Avional and Anticorodal consists essentially in heating the worked, rolled, extruded or forged material to elevated temperatures, followed by quenching to room temperature and aging at room temperature or moderately high temperature. The aging consists in heating at 140 to 220 deg. Celsius.

Although tensile strength is increased by this process, the elongation is decreased. The tensile properties of both alloys may be widely varied by small differences in composition and by changing the temperature and the time of the aging treatment. In this way it is possible to obtain either an alloy with high tensile strength and hardness but with lower elongation and bending properties, or an alloy with higher elongation and better bending properties, but with lower tensile strength and hardness.

### To Extend Use of Four-High Rolling Mills

Development of the four-high mill method of rolling steel not only has brought about a revolution in the art of flat finished steel production, but the resulting economies form the basis for the bulk of expenditures that will be made for new equipment during the next year, according to George T. Ladd, president, United Engineering & Foundry Co., Pittsburgh.

Mr. Ladd recently stated that expenditure of more than \$50,000,000 by the large steel companies of the United States for new mill equipment is more or less definite. His company was one of the leaders in the practical application of the four-high mill method of rolling for hot and cold strip and wide plates. The company also was instrumental in developing and improving much of the auxiliary equipment required for rolling steel, bringing about lowering of upkeep and material costs.

# Galvanizer's Dross and Zinc-Iron Alloys

By WALLACE G. IMHOFF\*

ATTENTION is called to the fact that the zinc-iron alloys may not become crystallized, or have a definite form which can be recognized. For example, Fig. 6 shows four distinct zinc-iron alloys, clearly illustrated. The average iron content of these four alloys is 4.24 per cent. At top on the point is a very light alloy; then the main area of the cone is the second alloy; the third one is found between parts of the black area, and at the right below it; and the fourth alloy is the black area itself. Of these four distinct zinc-iron alloys to be seen at one time, none shows distinct crystal forms.

I have found that this alloying action of zinc begins at the melting point of zinc, although, of course, it is weak there. As the temperature is raised this alloying, or dissolving, action on the iron becomes stronger. In commercial drosses heating ("sweating") drives the zinc to the top of the bath, while the crystals settle and pack tightly at the bottom. As the crystals pack tighter the density increases, and with it the heat held in the mass. Tests showed a difference of as high as 80 deg. Fahr. between the dross, on the bottom of the pot, and the bath on the top.

## Dross Crystals Pack Tightly When Heated

Galvanizer's dross consists essentially of two component parts: the melt and the zinc-iron alloy crystals. On heating, two things appear to take place under practical conditions; first, the dross crystals pack tighter together at the bottom of the pot; and, second, when heating is carried to the extreme (overheating) there appears to be a loss of zinc from the zinc-iron alloy crystals.

Thus we might assume (for the sake of illustration) that the zinc-iron alloy formed just above the melting point of zinc (787 deg. Fahr.) is made up of 20 parts of zinc to one part of iron. As the temperature increases, the bond between the iron and zinc becomes stronger, to offset the increase of temperature, but at the same time five parts (say) of zinc are lost. A further increase of tempera-

ture increases the strength of the bond, but, for the sake of illustration, it will be assumed five more parts of zinc are lost, and the zinc-iron alloy combination is  $FeZn_{10}$ . It may not be this actual relation, but it appears to be something similar.

Attention is called also to the fact that the temperature is not over 900 deg., and that the crystal form of the zinc-iron alloy has always been found to be a rhombohedron (hexagonal system). The crystals are very long, slender and needlelike, as was illustrated in Fig. 4. A study of hundreds of samples of ordinary plant dross has in almost every case shown the crystals to be of this needlelike, rhombohedral form, when formed

under a 900 deg. Fahr. temperature.

Practical features to be noted are that as the temperature increases the zinc-iron alloy appears to lose zinc. This is illustrated by the top figures of the chart (Fig. 7). It is to be remembered that this chart does not represent actual values, but is made to illustrate what seems to happen under practical conditions, as shown by photographs made from plant dross and from experiments in the laboratory.

## Crystal System Changes Completely at Higher Temperatures

Above 900 deg. it has been found, both in samples of plant dross, and in the laboratory, that the crystal form of the zinc-iron alloy crystal changes from a rhombohedron of the hexagonal system to a pyramid of the first order of the hexagonal system. Also that the pyramid is built up of many hexagonal plates. The cross-section of each crystal is therefore a hexagon.

Fig. 8 shows a dross crystal of this shape in plant dross taken from a galvanizing pot operated at a temperature of 870 to 885 deg. The bottom of the pot in the dross was at a temperature considerably over 900 deg. This plant dross showed an iron content of 4.03 per cent. This change of crystal form has been verified by laboratory experiments.

Fig. 9 shows zinc-iron alloy crystals of the rhombohedral crystal type, which are the long, slender, needlelike crystals seen under 900 deg. This dross was made in the laboratory under definite, controlled conditions. The temperature was held at 900 deg. for 6 hr., and then the sample was allowed to cool slowly in the furnace over night.

One large crystal shown is parallel with the cutting plane of the specimen, while the other crystals have been cut at various angles as they lay in the melt. The cross-sections of these crystals are seen to be parallelograms. This illustration checks the crystal form of the plant dross shown in Fig. 4.

Fig. 10 is another laboratory experiment made under precisely identical conditions as that of Fig. 9, except that the temperature was raised 50 deg. higher, to 950 deg. The temperature was held at that point for 6



Fig. 6.—Four distinct zinc-iron alloys. Magnified 36 diameters.

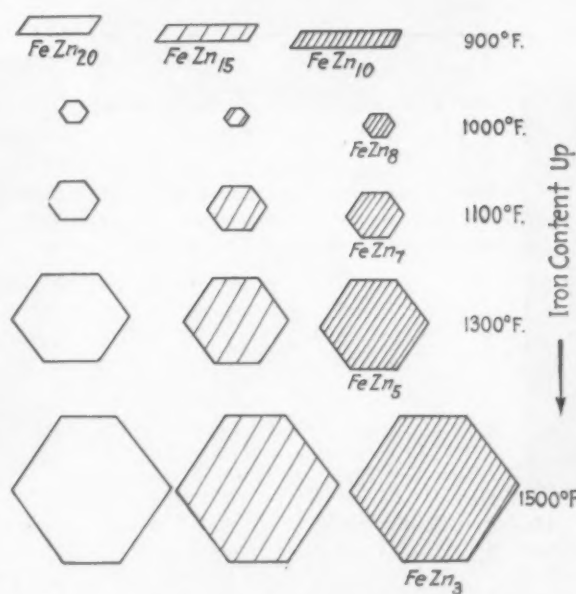


Fig. 7.—Theoretical chart illustrating dross composition.

\*Consultant in zinc coating, or galvanizing, Vineland, N. J. This is the second of three installments of the article. The first appeared Dec. 11.



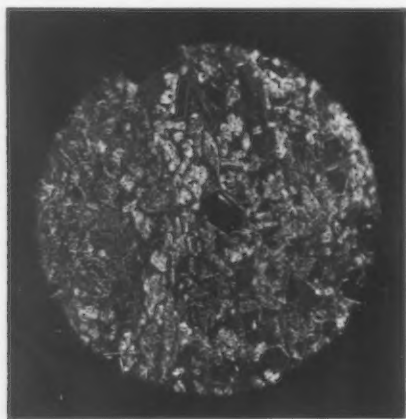


Fig. 8.—Plant dross showing the hexagonal form of the zinc-iron alloy, which is crystallized in a hexagonal pyramid of the first order. The iron content of this dross is 4.03 per cent. Magnified 36 diameters.

hr. and the melt left to cool in the furnace over night.

This small range of 50 deg. caused a radical change of crystal form of the zinc-iron alloy, from a rhombohedron to a hexagonal pyramid, both being in the hexagonal system. Here is a remarkable agreement between theory and practice, as seen in the crystal forms of Figs. 4 and 9, and in Figs. 8 and 10.

#### Crystals Lose Zinc as Temperature Goes Up

Again turning to the chart (Fig. 7) illustrating dross (zinc-iron alloy) composition: As the temperature rises there is evidence in practice that these crystals lose zinc, and that the bond between iron and zinc becomes stronger, to meet this increase of temperature.

In the laboratory the result of increasing temperature to 1000 deg. is shown in Fig. 11. Here is the crystal form of the zinc-iron alloy made under definite, controlled conditions. The temperature was held at 1000 deg. Fahr. for 6 hr. and the melt then allowed to cool in the furnace over night. The increase in the size of the crystals is

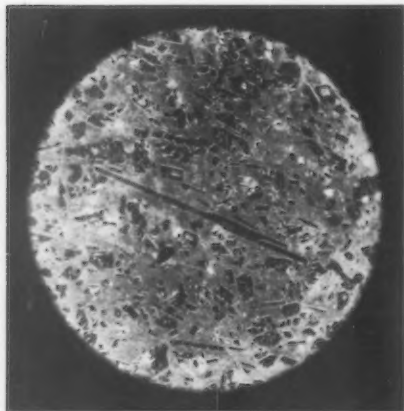


Fig. 9.—Dross (zinc-iron alloy crystals) made in the laboratory under definite, controlled conditions. The temperature was held at 900 deg. Fahr. for 6 hr. These crystals are rhombohedrons. Magnified 36 diameters.

notable, and also that the crystals are hexagons or pyramids in the hexagonal system.

Continued increase of temperature seems to follow the same general results of driving off more zinc and increasing the bond of strength between iron and zinc under a new combination at a higher temperature. As stated before, since no way of separating the crystal from the melt has been found, the exact chemical composition of the zinc-iron alloy cannot be given. The only thing which can be done is to assume that a loss of

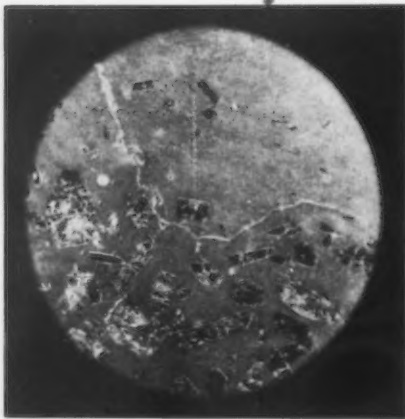


Fig. 10.—Dross (zinc-iron alloy crystals) made in the laboratory under definite, controlled conditions. The temperature was held at 950 deg. Fahr. for 6 hr. These crystals are hexagonal pyramids of the first order. Magnified 36 diameters.



Fig. 11.—Zinc-iron alloy crystals made in the laboratory under definite, controlled conditions. The temperature was held at 1000 deg. Fahr. for 6 hr. These crystals are hexagonal pyramids of the first order. Magnified 36 diameters.

zinc has occurred, and that the crystal form has changed, or been rearranged, to allow for this loss of zinc. Or to put the result in another way, the crystal form has been rearranged to meet the increase of temperature, which has freed a certain amount of zinc.

Fig. 12 shows the crystal form under definite, controlled conditions, with temperature held at 1300 deg. for 6 hr. The melt then was allowed to cool in the furnace over night. The crystals



Fig. 12.—Zinc-iron alloy crystals made in the laboratory under definite, controlled conditions. The temperature was held at 1300 deg. Fahr. for 6 hr. These crystals are hexagonal pyramids of the first order. The cross-section is therefore a hexagon. Magnified 36 diameters.

tals show a much larger size, but they are still pyramids of the first order, in the hexagonal system.

Finally the point is reached where the zinc burns off and crystals are left. The temperature was raised to 1500 deg., and the zinc-iron alloy crystal can be plainly seen in Fig. 13. These zinc-iron alloy crystals were made under definite, controlled conditions. The temperature was held at 1500 deg. for 6 hr. and the melt then allowed to cool in the furnace over night.

This completes the series of crystal forms, for at a higher temperature the zinc is oxidized rapidly. The forms on the theoretical chart (Fig. 7) agree well with the actual forms found in the plant and in the laboratory. The increase in iron content of the zinc-iron alloy is brought about by the increase in temperature, and the rearrangement of the components to meet the new conditions. The iron content increases with rising temperature.

(To be concluded)

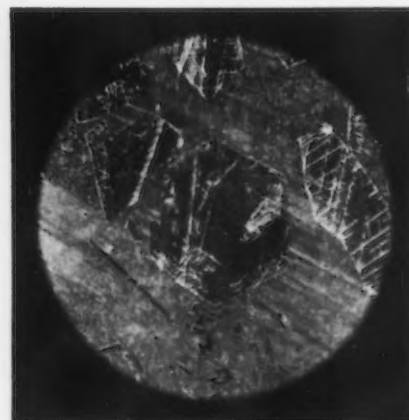


Fig. 13.—Zinc-iron alloy crystals made in the laboratory under definite, controlled conditions. The temperature was held at 1500 deg. Fahr. for 6 hr. These crystals are hexagonal pyramids of the first order. Magnified 36 diameters.



# Turning Straight Taper and Eccentric Diameters Simultaneously

By ALBERT L. HARTLEY

**A** TASK continually confronting the production engineer is that of accurately turning eccentric diameters and keeping the cost to a minimum. Fig. 1 shows the way that engineers of the R. K. LeBlond Machine Tool Co., Cincinnati, have solved this problem. As shown in this illustration the part has one taper, one eccentric and three straight diameters.

To machine the part, special tooling was designed for the company's standard No. 16 automatic lathe, as shown in Fig. 2. The cycle of operation is entirely automatic; the only duties of the operator are to load, unload, and engage the spindle and traverse clutches. Traverses to the work, feed to the end of the cut, and traverse back to the loading position are automatic. The standard machine, in addition to automatic power traverse to both front and rear carriages, is equipped with a three-speed Timkenized geared head with extra pick-off gears to give 15 spindle speed changes, and forced lubrication to all bearings in the head.

## Special Tooling

The special tooling used for turning straight taper and eccentric diameters simultaneously may be seen in Fig. 1. The front tool slide *B* travels in a longitudinal direction, as shown, and carries the special tool-block base *S*. The tool blocks *P* and *R*, which turn the three straight diameters, are mounted directly to this special base.

Taper turning tool-block *F* is mounted on a special slide in this

base. The slide is connected to the form plate *G*, which is held by bracket *H* so that it has no longitudinal motion relative to the tailstock. As the carriage feeds toward the headstock

the slide on which the tool-block *F* is mounted follows the profile of the form plate *G* and turns the desired taper. The link connection allows the entire tool slide to be traversed from the work, permitting ample clearance for loading.

The special driver mounted on the spindle nose, shown in Fig. 2, carries a master eccentric cam which actuates the eccentric turning attachment and keeps it in positive relation to the driving lugs.

The part turned, shown in Fig. 1, is made from drop forged S.A.E.

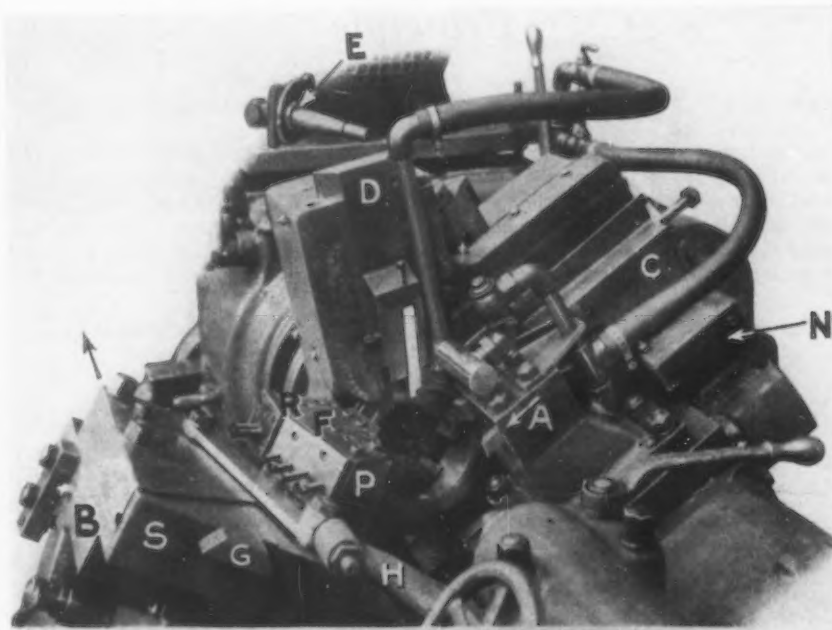


Fig. 1 (above)—The special eccentric attachment operates two facing slides.

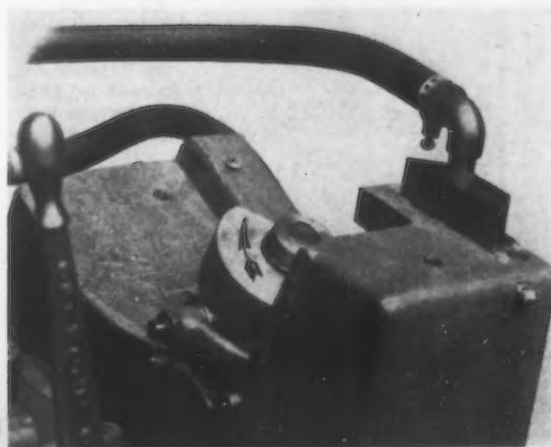
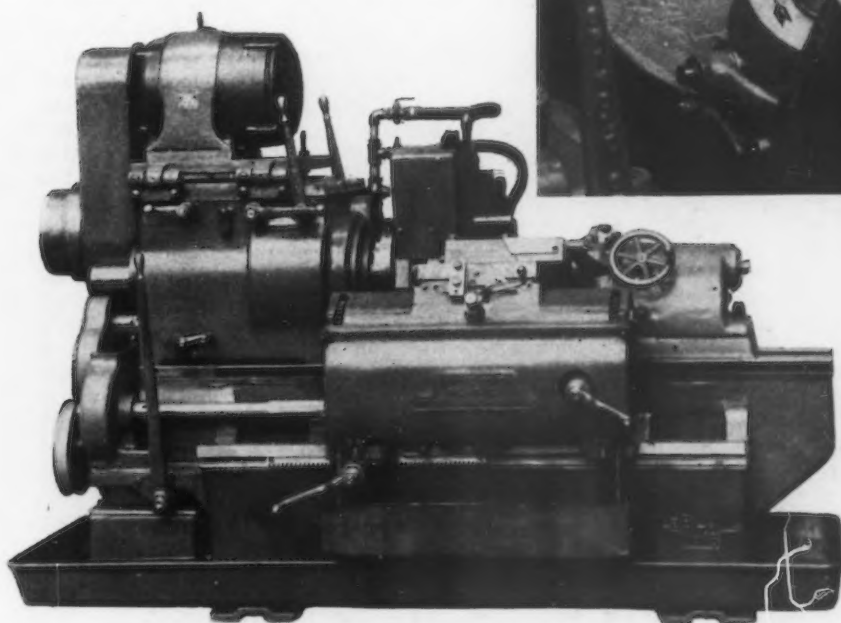


Fig. 2 (lower left)—LeBlond automatic lathe tooled to turn straight taper and eccentric diameters simultaneously.

Fig. 3 (at left)—Cam for operating roughing slide.



3135 steel. There is a maximum of  $\frac{1}{4}$ -in. stock to be faced off by the eccentric attachment. These conditions necessitate the use of two tools on the attachment. The roughing tool is set in the vertical slide *D*, Fig. 1, and the finishing tool is set in the slide *C*. The feed slide *N* is actuated by means of a bell-crank which is driven by a pinion that meshes with a special rack on the form bar in the rear carriage. A second bell-crank is connected to a shaft on which is mounted a lever for feeding the finishing slide *C* and a cam that actuates the roughing slide *D*. This cam is

shown in Fig. 3. As the cam turns in the direction indicated, the slide *D* is forced down until the cam is on land. The finishing tool, mounted in the slide *C*, is set so that it follows the roughing tool and in this way it takes a light cut and accurately reproduces sizes. The tool-block *A*, mounted on the standard rear top slide and

traveling in the direction shown, chamfers the end and chamfers and faces the shoulder *E*.

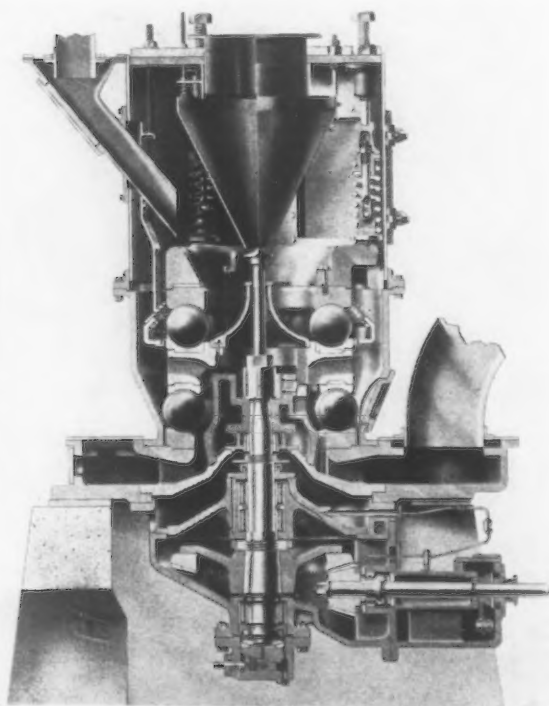
The drop-forged steel part to be machined has an average cut 3/16 in. deep. A total length of 7 in. is turned and the maximum finished diameter is 2 3/4 in. Production of 25 parts per hour is being obtained.

## Coal Pulverizer Has Simple Grinding Principle

**P**ROGRESS in burning pulverized coal has led to the development, by the Fuller Lehigh Co., Fullerton, Pa., of its Type B pulverizer. It retains desirable features of the Lehigh mill, including the spherical ball and grinding ring principle of pulverizing, in which fineness is not affected by

The power consumed varies with the coal feed.

Essentially the mill consists of a top or separator section, an intermediate or pulverizing section and a base or drive section. The top section is of heavy steel plate and cast iron construction and contains the



**P**RESSURE between the balls and grinding ring is obtainable in any amount desired independently of the mill speed. This, with the two full rows of balls grinding under high pressure and at low speed, gives smooth and quiet operation and high capacity and fineness.

wear of grinding parts, and the absence from the grind-zone of parts requiring lubrication.

Since the pressure between the balls and the grinding ring is an important factor in obtaining fineness and capacity, the new mill is so designed that this pressure in any amount desired is obtained independently of the mill speed. This feature, combined with the use of two full rows of balls grinding under high pressure and at low speed, results in a quiet and smooth-running mill giving high capacity and fineness. The pulverizer has no metal-to-metal abrasion of grinding parts, and wear of these parts is practically the result of coal abrasion. The balls wear spherically, resulting in a low maintenance and power consumption.

classifying cone, coal spout and the mechanism for adjusting the grinding pressure. The intermediate portion is of heavy-section cast iron with carefully machined flanges, to which are fastened the top and base sections. Grinding elements, coal basket and driving yoke are mounted in the intermediate section. The base or drive part is also of heavy-section cast iron and provides a very rigid support for the mill. This section incloses the air distributing chamber, main and thrust bearings, drive shafts and gears and the force-feed oiling system.

Two rows of large-diameter balls, and two stationary and one rotating grinding ring, constitute the grinding elements. The rows of balls, one

mounted above the other, are separated and propelled by the rotating ring, which is driven by and floats on the main driving shaft. Both the stationary and rotating grinding rings are made to gage, to insure interchangeability.

Grinding pressure between the balls and rings is applied and kept uniform by externally controlled steel springs mounted in the top section. The main driving shaft is supported by a self-aligning heavy-duty Rollway thrust bearing. No thrust or hammering, resulting from grinding, is imposed on the thrust bearing, because the mill is so designed that all thrust from this source is absorbed by the heavy lower casing. No lubrication is required within the grinding zone, as all bearings and gears are effectively sealed from the grinding and are lubricated by an automatic force-feed oiling system.

In operating, the pulverizer raw coal, crushed to pass through a 3/4-in. ring, is fed to the mill from an overhead bunker by means of an independent drag feeder. It drops through the feed spout on a rotating cone inside the upper row of grinding balls, whence it is thrown outward into the path of the grinding balls by the centrifugal action of the revolving cone.

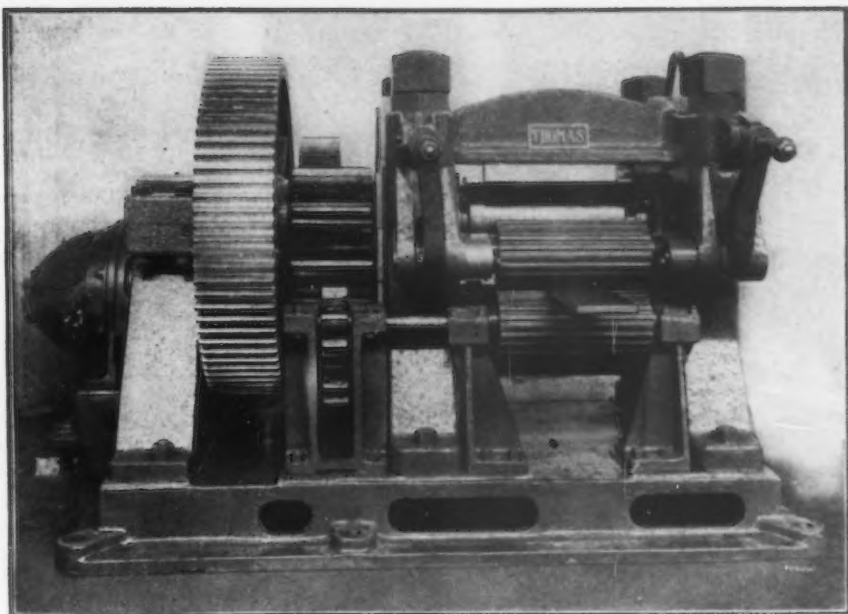
After being ground in the upper row of balls, practically all of the coal is fine enough to pass through the annular opening formed by the intermediate grinding ring and the coal basket. Any foreign and ungrindable material, such as tramp iron, pyrites and rocks entering with the coal, is rejected by the balls to the coal basket.

The pulverized coal, after passing through the annular opening, encounters currents of preheated air that enter the air distributing chamber in the base and are discharged through openings in the intermediate grinding ring. Fines are entrained and carried upward by the air stream, while the coarse particles of coal drop into the lower row of grinding balls for further pulverizing. Upon reaching the desired fineness the coal is carried upward by the air stream.

The principle of air separation used in the Type B pulverizer is such that fineness is controlled by regulating the air flow and varying the position of the adjustable sleeve inside the classifying cone. While tests have shown that it is not uncommon for 80 per cent of the coal pulverized in a Type B mill to pass through a 200-mesh screen and 90 per cent to pass through a 100-mesh screen, the mills are generally adjusted to obtain a fineness of 65 to 70 per cent through a 200-mesh screen and not over 2 per cent which will not pass through a 50-mesh screen.

Air volume used to effect separation is relatively small, varying from 25 cu. ft. to 30 cu. ft. per pound of coal. This air is controlled independently of the secondary air. The pulverizer is built in capacities up to and including 40 tons of coal an hour.





## Heavy Rotary Scrap Shear

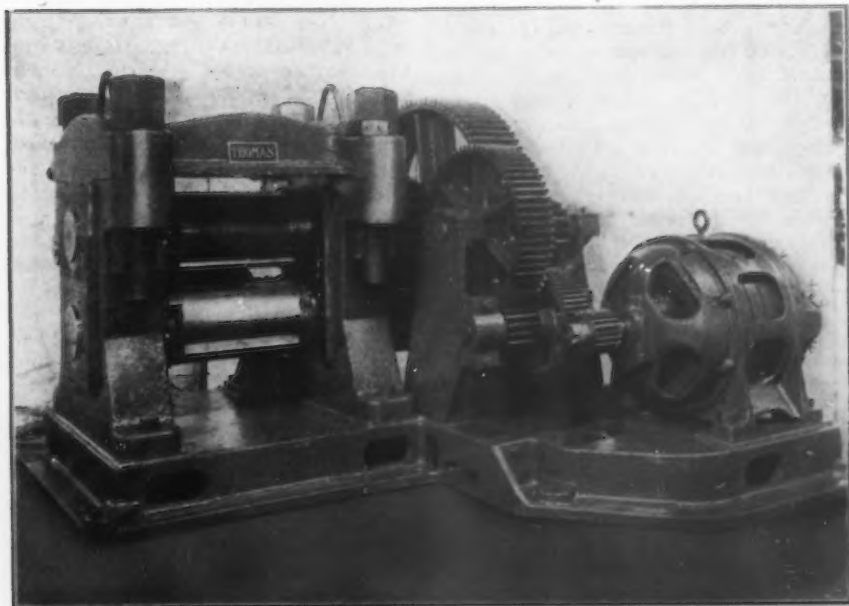
**A** NEW and improved type of scrap shear recently developed by the Thomas Spacing Machine Co., Pittsburgh, is built to handle material up to 20 in. wide by  $\frac{3}{4}$  in. thick at the rate of 100 ft. a minute. This speed may be synchronized with any mill speed by using a variable-speed motor. The blades, making four cuts in every revolution, shear the scrap material into easily handled lengths of 15 in.

Embodying many new construction features, but, at the same time, conforming closely to usual rolling mill practice, this machine may be adapted to almost any kind of trimming shear. A single bedplate, to which all parts

are fastened, is used, to allow the economical replacement of parts. The housings, bearing stands and all other cast parts of the machine are of especially heavy steel. The gears are keyed and press-fitted on the shafts and all stresses on these gears are figured exceptionally low, to insure long life and great overload capacity.

All shafts are of open-hearth steel forgings and are held to close tolerances. The bronze-bushed bearings are moderately loaded, to insure long wear life, and are easily accessible for replacement. The cutting blades are specially ground and may be easily removed for sharpening.

At present the unit pictured is



Feed side of shear (above), with corrugated feed rolls, the lower one being driven, while the upper is held to the work by spring above. Rotary cutters have blades which may be removed easily for sharpening.

simultaneously cutting scrap taken from both sides of the trimming shear. In addition the shear is so situated that it handles miscellaneous scrap from all parts of the mill.

## Pedestal-Mounted Precision Sensitive Drill

**T**HE high-speed precision sensitive drilling machine, model R-53, built by the High Speed Hammer Co., Rochester, N. Y., is now available with pedestal mounting, as illustrated. The three-speed pulley combination is designed for spindle speeds of 1500, 3000 and 6000 r.p.m. The foot pedal arrangement permits the operator to

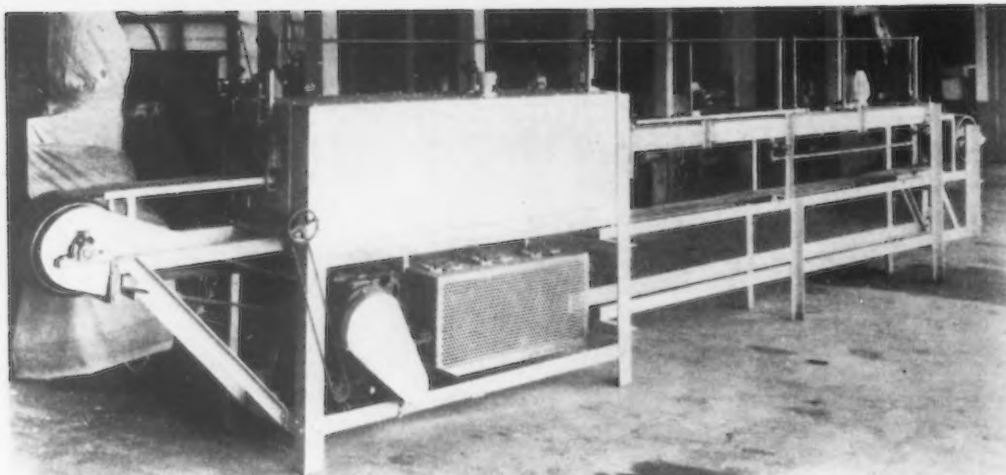


employ both hands in manipulating the work.

The machine will drill holes up to  $\frac{1}{4}$  in. in diameter to the center of a 6-in. circle. The spindle travel can be set accurately by the depth gage; the maximum travel is  $2\frac{1}{4}$  in. The base has working surface of 4 in. x 6 in. and will take work up to  $7\frac{1}{2}$  in. high. The hardened and ground spindle is guided by a quill supported by annular ball bearings, while two ball thrust bearings carry the top of the spindle at the feed arm. Parts ground accurately to size and alignment include the quill, feed column, main column and table. The table has a self-cleaning taper, keeping the main column free from chips and consequent injury.

In cooperation with the Northwestern Mfg. Co., Milwaukee, manufacturer of electric motors and dynamos, the college of engineering of Marquette University, Milwaukee, conducted its first annual electric arc welding clinic on Dec. 1, 2 and 3, at the university. Leading authorities on brazing and welding from the Central States addressed the clinic, which was directed by Franz A. Kartak, dean of the college.





**C**ONTINUOUS conveyor furnace for bright annealing of small parts. Automatic control of time and temperature is a feature.

## Conveyor Furnace for Bright Annealing

**A**N electric conveyor furnace, with controlled atmosphere for bright annealing of blanks and stampings of ferrous and non-ferrous metals and alloys, has been brought out by the Process Engineering & Equipment Corp., Attleboro, Mass. Oxidation and the formation of scale are prevented by the use of gas or a vapor in the furnace.

Many of the operations involved in the common practice of annealing are avoided, such as pickling and clean-

ing. Material is placed on the conveyor belt from the tote box, and delivered by the conveyor to the discharge tote box bright, clean and dry.

Furnace operation is said to be economical with regard to power and the special atmospheres used. Handling time is reduced, and annealing temperatures and time are automatically controlled. Being electrically heated, the unit is clean, quiet and odorless and may be placed directly on the operating floor.

with the drivers by either a pump handle, a horizontal tiller or a wheel.

The front wheels on the small truck have 6 in. x 4 in. tires and those on the heavy-duty machine 15 in. x 8½ in. pressed-on tires. The drive tires are 15 x 5 in. and 22 x 6 in. respectively.

All controls on both trucks are immediately in front of the operator, for his convenience and safety. Platform is elevated by closing an electric switch which automatically trips when the platform reaches its maximum height, or it may be tripped manually at any point, to arrest the upward movement. To speed up performance the truck may be driven forward as soon as the load skid is off the floor, for the separate lift motor will continue to elevate the load in transit and stop the platform when it reaches the upper limit.

The larger truck is fitted with a gas-electric power unit, which furnishes current for both the elevating and travel motor, while the controllers afford absolute control of power, which is produced in proportion to the demands of the motors.

## Large and Small Lift Trucks of Like Design

**T**WO extremes in capacities are provided in new electric lift trucks of two sizes illustrated, added to the line of the Elwell-Parker Electric Co., Cleveland. The two trucks are built along the same general lines. The large truck has a rated capacity of 10 tons. Its lift platform, 40 x 144 in., stands 18 in. from the floor. The smaller truck, developed to handle hand-lift-truck skids, has a rated capacity of 1¾ tons. Its platform is 18 x 41 in. and has a 7-in. clearance.

Important features found in the larger truck are duplicated in the smaller one. Drop forged parts are

used in the two machines, as the same proportion of stresses must be absorbed by similarly placed members. The loads are carried by the front axles, which have Timken tapered roller bearings.

All four front wheels on the larger machine steer concentrically with drivers on the other axle. The inside wheels turn approximately 33 deg. and the outside pair of wheels at a 29-deg. angle. When the operator swings the steering wheel his front wheels move through an arc of 62 deg. On the smaller machine the front wheels are steered simultaneously

## New Reversing Motor of ½ to 5 Hp.

**A** NEW line of single-phase, repulsion induction motors, designated type SCA, capable of very frequent reversal, is being made by the General Electric Co. These motors have the same appearance as type SCR general-purpose, single-phase motors, and are mechanically interchangeable in all respects, with corresponding horsepower and speed ratings, of that type. They are said to be particularly adaptable to use in driving machine tools.

Available units range from ¾ to 5 hp. at 1800 r.p.m., and from ½ to 2 hp. at 1200 r.p.m. The starting torque is said to be high and ranges from 225 to 275 per cent of normal full-load running torque, depending on the rating.

Control for the new motor is very simple, consisting only of a full-voltage, three-pole, reversing switch, which may be either manual or magnetic.



Big and little, they have the same general features. One truck shown has 10-ton capacity; the other, 1¾-ton.

# European Manufacturing Plants Slowly Emulating American Methods

**R**ESULTS of the introduction of American methods of management and American equipment in European manufacturing plants were discussed at a management meeting of the American Society of Mechanical Engineers in New York on Thursday, Dec. 4, by Wallace Clark, of Wallace Clark & Co., consulting management engineers, New York. Mr. Clark has spent the last three and a half years in plants and mines of European countries, including Poland, Germany, France, Switzerland, Czechoslovakia, Roumania, England and Denmark.

"The growing interest of European industrialists in American management is well known," said Mr. Clark. "For a long time they believed that the purchase of the most efficient machines and equipment would bring them American prosperity, but they have learned that what we do over here with management is quite as important as machines and processes.

"The characteristic of European industry most frequently discussed is that there is less mass production than in America. One reason is that the countries are smaller and the tariff walls prevent the distribution of manufactured articles to a body of consumers large enough to justify mass production. Consumption also is limited by the marked differences in habits of the people in the various countries. The third reason is that wages are low and therefore purchasing power of the average family is not sufficient to enable it to buy many of the manufactured articles which in America are purchased in mass. Consumers, particularly in France and England, also demand greater individuality of design than we do."

## Some Mass Production in Europe

Mr. Clark said that, despite these drawbacks to the complete emulation of American methods in Europe, there has been a good deal of mass production in the European countries, accompanied by a strict standardization of design and the use of automatic machines and of moving belts for assembly. He said that some companies, by standardizing design, reducing the number of styles and rearranging production to match the tempo of moving belts, have increased output 25 per cent or more, and have so greatly improved the quality of product and lowered its cost that they have built up domestic sales and some

have opened up foreign markets which were not known to exist.

A slower turnover of investment is another characteristic of European plants that Mr. Clark commented upon. He said that raw materials are kept in stores much longer than necessary and work moves deliberately through the processes of manufacture. This slower time of production requires more investment in proportion to the volume of sales than in the United States.

As to the results that European methods have achieved, he cited the case of a Polish plant employing about 3000 workmen, where new methods of management increased production 55 per cent with the same number of workers. This result was attained by the purchase of a relatively small amount of new equipment and no changes in executives.

## Class Distinctions a Drawback

"Europe suffers somewhat," said Mr. Clark, "from the fact that the executives of plants, from the superintendent up, invariably have engineering degrees with good theoretical training behind them, but seldom have any actual shop experience. On the other hand, good shop men are very seldom promoted to positions of responsibility and management. The workman does not expect promotion from the ranks and does little to fit himself for it." Class distinctions are becoming relaxed in European manufacturing plants, Mr. Clark said, but still are one of the causes for a lack of completely harmonious operations from top to bottom.

"In a Polish spinning mill," he said, "we found a need for more supervision over some of the difficult operations, such as doubling and twisting. The superintendent said there was no one who could be assigned as supervisor. On being asked who knew most about this particular operation, he replied by unhesitatingly naming one of the operators, but said that she would not do because she was just one of the peasant girls and no one would respect her and follow her orders. However, he consented to give this girl a chance, and a few weeks later he told us that the other operators were all willingly obeying her instructions, and that the production of that battery of machines had so far improved in quality and quantity that they were no longer holding back

other operations. Such promotions from the ranks are not so frequent as they should be, and the reason is not so much that executives oppose them as that it does not occur to any one that they can be done."

Mr. Clark gave a good deal of detail regarding various phases of the European management problem. He expects, he said, to see further changes, as European plant managers are realizing that more flexible methods are necessary for their future success.

## Discussion Embraces Many Subjects

Mr. Clark's paper resulted in a lively discussion, which ranged from conditions in Soviet Russia to the business depression as it affects the United States.

Among those who participated in this discussion were: J. D. Mooney, president, General Motors Export Co., New York, who was chairman of the meeting; Harrington Emerson; W. L. Batt, president, S.K.F. Industries, New York; Frank M. Ryan, works manager, Norton Grinding Wheel Co. of England; A. L. Williston of the American Council of Education, Washington; Philip B. Brill, lecturer on industrial management at Yale University; and Charles M. Mills, formerly assistant to the president of the Standard Oil Co. of Ohio.

Harrington Emerson described the present business stagnation as sheer "stupidity," and said he had borrowed this word from Col. Arthur Woods, chairman of President Hoover's committee on unemployment, who had used it in the same manner at another meeting of the A.S.M.E. Mr. Emerson offered no way out of the business dilemma, but said that a reduction of wages would be a blow to engineers and scientists and a discouragement to the genius which has made possible a high standard of living in the United States. If we were to lower our wages, it would be a decided step backward, he said.

Several of the speakers agreed that the outstanding problem of the next 10 years in American industry would be the development of scientific and more economical means of distribution. A point was also made of the need for scientific study of consumer requirements so that production may be fitted to definitely ascertained needs.



## Western Metal Congress to Be Held Feb. 16-20

**I**RON and steel subjects and displays will occupy a large part of the widely varied program of the National Western Metal Congress and National Western Metal and Machinery Exposition, to be held Feb. 16 to 20 in the municipal auditorium, San Francisco. While dates for the various sessions have not been settled upon, it has already been decided that the American Welding Society will take over two half-day programs, either all of one day or two consecutive mornings.

M. C. Smith, of the Stoodly Co., Los Angeles and Whittier, Cal., will discuss welding of alloy overlays, according to the tentative subject assigned him, while another Stoodly Co. speaker is scheduled to talk on "Coated Welding Rods and Coated Electrodes." W. N. Dunlap, of the Aluminum Research Laboratories of the Aluminum Co. of America, Pittsburgh, will discuss welding aluminum and its alloys, and J. C. Hodge, metallurgist of the Babcock & Wilcox Co., Beaver Falls, Pa., will discuss fusion welding. Acetylene welding is the subject assigned to an as yet unnamed speaker from the Linde Air Products Co.

In the American Chemical Society session will be heard: F. N. Speller, of National Tube Co., Pittsburgh, who will review the corrosion findings for 1930, and M. A. Grossman, of Republic Steel Corp., Canton, Ohio, scheduled to talk on chromium and chromium-nickel steels.

Various other societies, taking part in the program as announced up to date, are: American Society for Testing Materials, American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, Institute of Metals, National Purchasing Agents Association, Pacific Coast Electrical Association, Pacific Coast Gas Association, Society of Automotive En-

gineers and National Association of Power Engineers.

Arrangements have been made for a total congress registration of 5000, but expectations are that more than 60,000 persons, identified with metal industries or interested in the part that metal plays in industry, will attend the exhibition.

This will be the second appearance of the congress and exposition on the Pacific Coast, the event having been held two years ago in Los Angeles.

## Steel Founders Hopeful at Chicago Meeting

**I**MPROVED sentiment in business, a noticeable pick-up in inquiries, and in many instances December operations above the November rates were reported at the Dec. 11 meeting held at Chicago by the Steel Founders' Society of America. Reports on action taken in recent months on wages disclosed that, while some foundries have scaled down salaries, day wages and piece rates, this move has not become general. In fact, some piece rate adjustments have been made on old rates which were known to have been out of line for some time past.

Arthur Simonson, Falk Corp., Milwaukee, vice-president and chairman of the Midwest-Southern division of the society, who presided at the meeting, believes that the purchaser is willing to pay the price which assures continuity of supply, and this can be brought about only as a result of profits made by those engaged in a given industry. Further, if there is only enough business to keep occupied 50 per cent of the capacity of an industry, then this situation must be recognized and met. To do otherwise is to be unwarrantably selfish.

In a period of depression, such as is now being experienced, the producer must forget about excess of capacity and he should base the cost

of product, not on some theoretical percentage of output but on the per cent of operations that actually exists. If production is at 50 per cent of capacity, then cost should be figured on this basis. In the meantime, it should be the aim of every producer to hunt for new outlets for his product.

Salvation of the foundry business, the speaker said, lies in recognition of the fact that total cost, plus profit, equals selling price. The buyer is willing to pay a fair price, which does not mean a disastrous price to the producer.

A feature of the meeting was an address by Dr. Ancel St. John, president, X-Ray Service Corp., New York, on "X-Ray Inspection in Metal Industries." Extracts from this will be published in latter issues of THE IRON AGE.

## New England Group Meeting of Steel Treaters

**A** SPRING sectional meeting of the New England chapters of Boston, Providence, Worcester, Springfield, Hartford and New Haven of the American Society for Steel Treating at Hartford on April 14 has been assured by the acceptance of all the chapters. Preparations are being made to entertain more than 500 members and their friends. There will be two technical sessions in the morning, several plant visitations in the afternoon, and dinner, entertainment and an address in the evening.

The committee has secured for the technical sessions Dr. V. O. Homerberg, professor of physical metallurgy at the Massachusetts Institute of Technology, and E. W. Page of the General Electric X-Ray Corp., Chicago. Dr. Homerberg will give a résumé of the developments in nitriding. Mr. Page, whose subject will be "X-Ray as It Applies to Industry," will discuss latest developments of the X-Ray in metallurgy.

## Mirror-like Surface on Steel Sheet



**A** CHROME-NICKEL sheet, 60 x 173 in., one of the largest ever rolled and polished, was one of the exhibits of the Republic Steel Corp. at the Dairy Industries Exposition at the Public Auditorium, Cleveland, the week of Oct. 20. The sheet, Enduro Nirosta, KA<sub>2</sub>, was produced at the Central Alloy Works at Massillon. Ability to produce chrome-nickel stainless steel in large sizes is helping to solve one of the problems of dairy implement manufacturers by the elimination of welded seams in certain types of dairy equipment. Chrome-nickel stainless steel is claimed to have been found ideal for dairy products applications, as it is impervious to the action of milk products and to the cleaning agents used.



# Making Apprentice Training Pay

## Dividends in Satisfaction

**T**WO papers on apprentice training, both with the background of its use in States largely agricultural, but with growing industrial centers, were read Dec. 3 before the American Society of Mechanical Engineers at the annual meeting in New York. One was "Apprentice Training in Virginia," by C. F. Bailey, engineering director, Newport News Shipbuilding & Dry Dock Co., Newport News, Va. The other, "Apprentice Training Movement in Wisconsin Industry," by Harold S. Falk, vice-president and works manager, Falk Corporation, Milwaukee, was read, in his absence, by C. J. Freund, of that company.

Abstracts of the two papers follow, together with the main points brought out in the discussion, which was combined, after both papers had been read.

### Apprentice Training in Virginia

**V**IRGINIA, along with the rest of the South, Mr. Bailey said, is becoming industrially minded. This stresses the need for education for the industries and the arts. The transportation companies, iron works and shipbuilding concerns require skilled mechanics, trained through apprenticeship. The primary principles in apprentice training are, first, careful selection of candidates; second, importance of the supervisor; and, third, the sympathy and aid of the management.

Enlarging on this point, the author laid down three "laws" governing the matter of apprentice training, thus:

*First Law: Candidates must be physically fit, mentally superior, morally hopeful—hand, head and heart.*

We should include in this intensive apprentice training no boy who has not these desirable characteristics in an outstanding degree. The mediocre candidate displaces one of the promising type who might become an effective influence in industry and the community.

*Second Law: The supervisor of apprentices and the instructors must stand forth prominently in manipulative skill, intelligence, training aptitude, mental resourcefulness and application, and in the high principles of*

**D**EARTH of skilled mechanics, even in these parlous times, makes highly important the training of young men for industry. State cooperation with manufacturing plants is described in one of the papers here reviewed. The intimate tie-in with vocational education in schools was stressed by several speakers. Dividing the boys' time between school and shop appears to be the approved course, with the time division changing as the boy grows in age and skill.

*self-control, citizenship and interest in and vision of the possibilities of the boys' future.*

To make apprentice training successful, not only must we have the choice, selected personnel, but there must be a realization on the part of the management of the need—an inspiring interest in young men and a willingness to spend time and means to promote such training, not only for the good of the company, but for the benefit of the individual, the community and the country.

*Third Law: The management must be imbued with a hearty interest in the apprentice, visualize his possibilities, recognize the mutual interest existing, and provide both matériel and personnel to foster his training.*

The matter of the apprentice wage is of vital importance. The wage at the beginning and throughout should be liberal, although at first the apprentice may not earn much. This tends to attract the better class and gives a far superior list of applicants from whom to choose. It is the policy now in some cases to select only those who have had the equivalent of a high-school course, because of their proved capacity for development.

### Incentives a Prime Need

The inspiration coming to any manager in watching the progress and development of bright young men is one of great uplift and value. There comes to be a feeling of interest in the boy which is reciprocated by him, and which is a great factor in the labor problem of the time. The apprentice should be taught the value of

efficiency and given incentives which will develop intense reaction in this respect.

These incentives may take the form of the assignment of choice jobs to such as show the ability, interest and willingness required; the increased interest of the supervisor and the management, without danger of partiality; and later, as skill is developed, increased remuneration by the adoption of a system of payment whereby the regular hourly rate is supplemented by a bonus or premium based directly upon the character and amount of work performed, which may be established either by contract or in other ways.

The products of a well planned and well directed apprentice training course, where the attractions offered are such as to draw the brightest, most intelligent material, are greatly improved labor conditions, highly skilled mechanics, an intelligent, happy citizenship and a supply of potential supervisors, foremen and even superintendents.

A few years of a young man's life at this age is not wasted in service before he rises to a position of greater authority. As Eugene G. Grace says: "Not only is the hard work, in humble jobs, a test of these young men's endurance, but it serves to give them a background of sympathetic understanding of the workman's point of view which enables them, as executives in later years, to strike a just balance between their duty to the corporation which employs them and to the men who work under their direction."

### Apprentice Training Movement in Wisconsin Industry

**A**PPRENTICE training in Wisconsin has been made a concerted, organized effort, Mr. Falk says. In developing the work important considerations and tendencies have been taken into account, such as the shortage of skilled mechanics in American industries at present in spite of considerable unemployment, the requirements of production as well as of jobbing industries for trained men, and the importance of the human factor in all industry.

Employers and employees have cooperated in the promotion and sup-

port of an apprenticeship law in the State which stabilizes and dignifies apprenticeship by preventing exploitation of boys and by setting standards of workmanship in the trades. As a result of public favor and the enthusiasm of influential individuals, apprenticeship training has developed rapidly in the State. There are 3350 apprentices employed and 2567 have graduated in the last 15 years. At present about 325 are graduating each year.

To make apprentice training a social factor, on the one hand, whereby organized experience may be provided for the maximum number of those who wish to follow skilled trades, and, on the other hand, to provide a proper

quota of skilled mechanics for the industries of the community, the training of apprentices must not be carried on merely by one or the other random employer, but must become a general institution in as many business and manufacturing establishments as possible.

#### State and Industry in Harmony

Wisconsin employers were themselves largely instrumental in the passing in 1911 of the apprenticeship law whereby the Industrial Commission of Wisconsin is authorized and enjoined to direct and supervise the training of young men in the industries. In many trades and industries

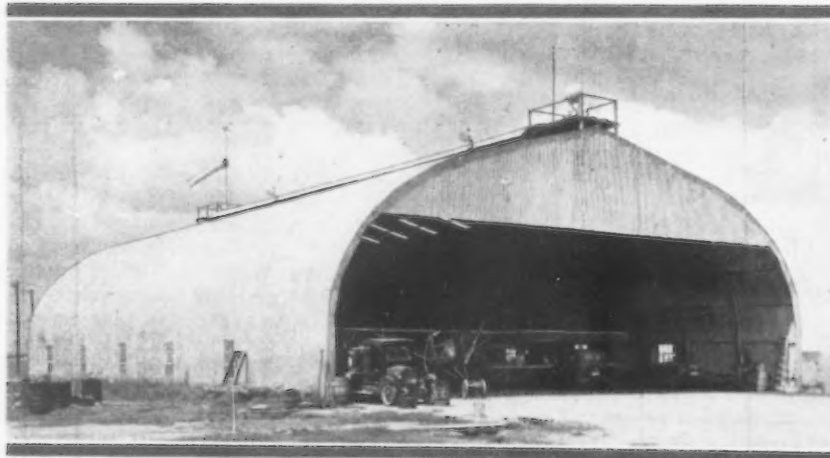
committees have been appointed which cooperate with the commission and direct the apprentice affairs of their respective organizations and promote the movement in every way practical. As a result of all this, apprenticeship in the State has achieved a dignity and a stability which would not be possible otherwise.

In some parts of the country, according to reliable reports, there is a distinct shortage of skilled mechanics even now.

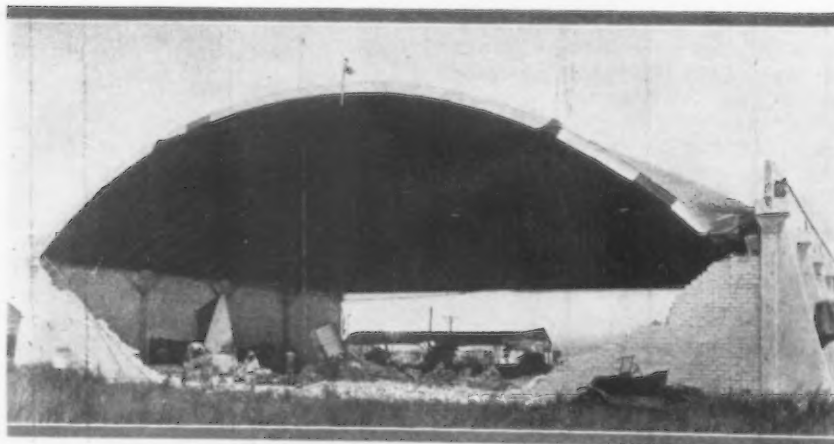
The term highly skilled mechanic is here taken to mean an artisan who is fully qualified in all branches of his trade, and not merely in one operation.  
(Continued on page 1899)



Arc-welded hangar during construction.



This arc-welded sheet metal building withstood the cyclone.



Damage done to a masonry hangar at the Houston airport by a cyclone.

## Arc-Welded Hangar Unhurt by Cyclone

THE strength of arc-welded sheet metal buildings was demonstrated recently when a cyclone struck the Houston, Tex., airport, causing a damage of approximately \$50,000 to planes and a masonry hangar, but passing over three arc-welded steel hangars without even as much as causing a disturbance.

The damage done to the masonry hangar is shown in one of the pictures. This masonry hangar was built to house air mail planes as required by officials of the postoffice department, when Houston was put on an air mail route. The welded sheet metal hangar, also shown, is one of three which had been erected at the Houston airport some time before when it was learned that the air mail route was to pass through Houston. The postoffice inspectors recommended the masonry hangar, and it was this masonry hangar that was demolished by the Texas "twister." Five planes housed in the building were also damaged.

The general method of construction of the welded steel hangars is shown in the reproduced photograph taken during their erection. It is stated that the cost of its erection was approximately 20 per cent less than a hangar of masonry construction of the same size. The welding apparatus used was manufactured by the Lincoln Electric Co., Cleveland.

# Industry Getting Under Way at Last

BY LEWIS H. HANEY

DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

**I**N the face of further bank failures and crumbling security prices it is reassuring to turn to real production as represented by the nation's basic industry, steel. Here we find rail contracting getting under way and a good volume of tin plate contracting for the first half of 1931. A fair volume of structural steel awards and some renewed activity in pipe line demand are apparent. Prices of certain kinds of finished steel are being maintained.

Wall Street may have to make further atonement for the sins of 1929. Those caught in the water of over-capitalization may go down. But the steel industry goes on. In our attitude toward the nation's basic industry, we should guard against becoming infected with the financial pessimism of the day.

Production in most industries is now so curtailed that the adjustment of supply to demand is near. On the average, industrial production is 25 per cent below normal, which is low enough. Reason and precedent both indicate that industrial recession is nearly at bottom and that the prices of basic raw materials must become stabilized within a few months.

## Pessimism Not Warranted

But, while the greatest immediate danger lies in the extreme of pessimism concerning real business as contrasted with "high finance," there is also still some danger of trying to stabilize a little too soon.

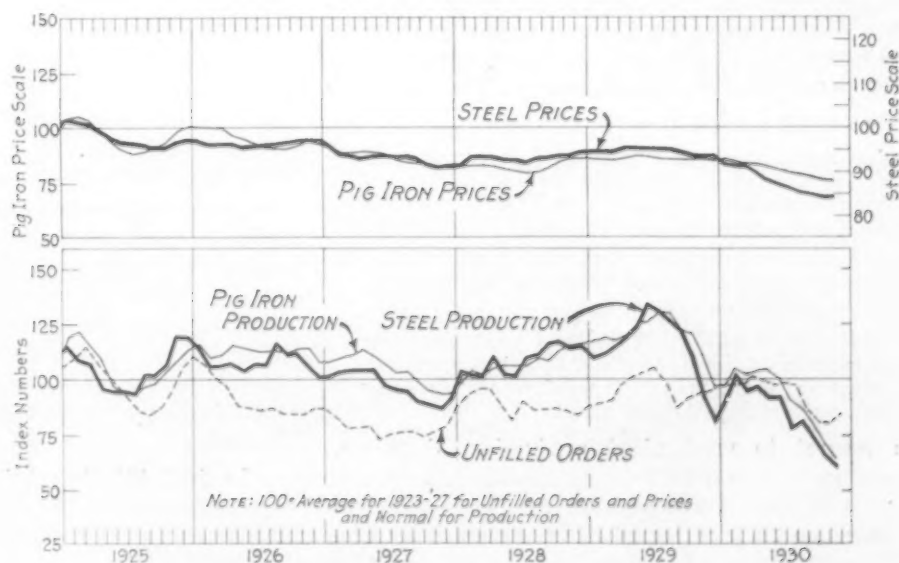
Generally, the wisest course is to stop at the normal bottom, which means neither crashing through to the depths of pessimism, nor trying to remain suspended at an untenable level.

There are certain indications that the steel industry may not be quite at bottom. Production is not so far below normal as it went in 1921. Scrap continues weak and pig iron is not strong, with Southern competition a factor in certain Northern markets. An economist may well suggest that hope should be tempered with caution, and stabilization with a due regard to the normal basis.

Iron and steel production curves in November closely resemble their position in March, 1921. They are between 30 and 40 per cent below normal. Steel production is relatively lower than pig iron, but has recently declined less rapidly than the latter. Also finished steel prices are high in comparison with the general commodity level. And, to complete the analogy, there was an effort to stabilize finished steel prices which actually brought a rise in the monthly average in May, 1921. If this analogy holds, we may expect bottom in the industry in something like four months.

Historical analogies are dangerous, but we may perhaps avoid undue optimism by noting that, though the decline in steel production was checked toward the middle of 1921, the industry did not get really turned around for nine or ten months after March.

Steel and pig iron production both dropped sharply, but prices are less unstable. While the upturn is obviously nearer, it is not likely to come in January.





W. W. MACON  
Editor

# THE IRON AGE

A. I. FINDLEY  
Editor Emeritus

(ESTABLISHED 1855)

## What the Sherman Law Should Permit

**I**N his last message to the Congress, the President recommended that attention should be given to a review of the Sherman law and its operation during the last 40 years, especially in the light of changes in economic conditions. Many thoughtful persons appreciate the need for such an examination and probably some amendment.

Undoubtedly there has been commercial and economic evil arising from it. This has been not so much from the law itself as from interpretations of it that have been made by the courts and by governmental bureaus.

The purpose of the law is to preserve free competition. The interpretation has been to prevent industrial cooperation.

The absence of competition is not necessarily a bad thing, as we see from situations in which there is monopoly. If some one owns the only mine producing an essential metal—or the only process, secured by patent, for producing it—competition can not by law be created. We see such monopolies pursuing their ways without criticism, indeed with popular approval for the stability that they afford and the squareness of their behavior. An intelligent monopoly aims ever to stimulate the use of its product and makes a price that will do so. The last thing that it would premeditate would be strangulation of consumption or even a policy of charging all that the traffic will bear.

It is conceivable that the manufacturer of an article of limited use might deem it desirable to be exorbitant, and that a group of such manufacturers might connive in such a policy, and in such instances the law against restraint in trade might usefully be invoked. We may, however, draw the attention of a fearful public, and its legislators, to the following fundamental principles:

1. Competition is not confined to the matter of price, but at a given price may be exhibited in the degree of service. (This condition is so familiar that no illustrations need be offered.)
2. Mechanized production, which is popularly being described as mass-production, implies competition as a natural corollary.
3. In the production of mineral substances the more expeditious the liquidation of a given reserve the more the profit up to the point where excessive production begins to destroy profit.

In respect to mechanized production, therefore, and especially in respect to the minerals and metals, the preservation of competition needs no political law, inasmuch as it is bound to be governed by economic law, to which also must there be obedience by monopolies. In considering the political law—the Sherman law—it may be useful to make a distinc-

tion between the production of commodities and the offering of services.

In respect to commodities there is, and has been, just as much competition in the London market, which knows no Sherman law, as in New York. Carried to excess, which implies industrial ignorance, there are the same economic evils there as with us. It has been tried to correct such evils by the formation of conventions and cartels. In principle this is an effort to enjoy the beneficence of the intelligent monopoly. In practice it works only to a limited extent. In industries of simple structure, such as the production of diamonds and of aluminum (in Europe) it works. In industries of widespread and complicated structure, enshrouded in the web of differences in economic organization, in nationalism, and in personalities, it fails, owing to the inability of producers to agree among themselves. The term cartel has become one of opprobrium in some minds that are emotional, let us say, but if it be a bogeyman it is one for humor rather than dread.

We do, however, have a real term of opprobrium in price-fixing, and in any renewed consideration of the Sherman law that is bound to be discussed. Let us think, however, just what may be meant. Price-fixing as was done by the Government during the war is economically abhorrent. Pricing, elastically, is quite a different thing, even if all producers name the same price, as they may do even now, and could not be expected to do otherwise. Producers might meet and discuss prices, even agree upon them, and still be competitive and unrestraining of trade, but under the court and bureaucratic interpretations of the Sherman law they might not safely do any such thing.

We think that it is in such a way that the Sherman law should be amended. It should be clearly made permissive to producers to confer in respect to their industrial problems, to agree among themselves for the adjustment of production to consumptive demand, and even to talk about price—for production, consumption and price theoretically constitute a triangular diagram—and such permission would not imply any need for bureaucratic control, not so long as there is economic law. In brief, the Sherman law should be explained to the effect that it should not be construed as forbidding agreements among producers of commodities for adjusting their combined production to natural consumptive requirement.

In fact, this is precisely the policy that the Government itself is urging upon the farmers. It is vociferating to them to curtail production until a profitable price is realized. It goes much further; lending them money to hold back their products and trying to manipulate the markets for them, or some

of them. Several of the States are governing and prorating the production of petroleum. The institutes in many industries go so far as to advise in a shadowy way but are too hamstrung to be effective. The Governmental thought in agriculture is that of an economic council, but the farmers are too numerous to be counselled. In industries of smaller and less willful personnel, however, a council if legally permitted might be useful, and it might even be allowed to be a cooperative.

### Wage Incentives Again to the Front

**W**AGE incentive systems, those departures from the straight hourly basis of reckoning that go to put the recipient in partnership with the employer and are calculated to fatten the pay envelope and raise the efficiency of manufacturing, may be installed with minimum friction under present conditions of curtailed employment.

Introduction of the new commonly meets with resistance. In the matter of a change in computing wages, it is not so much a fear of high-pressure driving, as was once the employees' view, or the feeling that the situation is made the wedge to put over a one-sided arrangement, as it is that mere inertia of the worker has to be overcome. Once a system is installed it would be found just as difficult to attempt a return to original practices as it was to discard them.

We are entering a period of marked consideration to efficiency. The effort will be to individualize the workers as does not obtain to the same degree with straight hourly wages. Management has learned that the equitable basis must be carefully ascertained. Otherwise there will be serious disruption should it become necessary to correct mistakes, and the esprit de corps that it was desired to build up will be destroyed. It is not difficult to get advice or learn the experience with regard to the various plans that are in practice.

### Rail Tonnage Will Stay Heavy

**T**HE sluggishness to date of the annual rail buying movement is no criterion as to the total movement for 1931 replacements, as there is likely to be heavier buying henceforth. As to the farther future the vogue of very heavy rails, say 120 lb. a yard and over, is only recent and it will be a long time before a sufficient total of track has been laid in these more durable rails to affect the total demand unfavorably.

In the six years 1923 to 1928 inclusive only about one-fifth of the tonnage of replacement rails was due to the rails being of heavier section. In 1923 Class I railroads had about 33,950,000 tons of rails in main line tracks while in 1928 they had about 37,575,000 tons. Meanwhile there was an increase of 8104 miles of main line track, accounting for about 1,300,000 tons of rails. The increase occurred by about 4450 miles of new road being built, with a slightly larger amount of multiple track, while fully 1100 miles of line was abandoned. The increase in tonnage of rails in main line track, minus the allowance for increased track mileage, leaves a trifle over 2,300,000 tons, ascribable to increase in rail section, and this is scarcely 20 per cent of the total 11,900,000 tons of replacement rails

reported as laid during the six years. Information as to weight of rails in track is available only through 1928, but replacements have also been reported for 1929. Class I railroads, those having annual operating revenue above \$1,000,000, but excluding switching and terminal companies, reported laying new rails for replacement purposes as follows:

#### Rail Replacement in Gross Tons

1923	1,729,696	1928	2,080,277
1924	1,791,162	1929	1,958,489
1925	1,950,146	Total	13,844,408
1926	2,209,873	Average	1,977,773
1927	2,124,765		

In general, replacements may be said to be running at 2,000,000 tons a year. While the first three years shown above ran well under that figure and the next three years well above it, 1929 was under 2,000,000 tons and it seems to be a fair estimate that this year has run well below the figure.

With 257,190 miles of main track in 1922 and 265,294 miles in 1928, the mileages laid in different sections of rail were in the following proportions:

#### Rail Laying According to Weight

Pounds per Yard	1922	1928
	Per Cent	Per Cent
Under 50	0.5	0.3
50 to 59	6.2	4.2
60 to 69	12.5	9.2
70 to 79	16.6	13.0
80 to 89	26.3	20.6
90 to 99	22.3	25.1
100 to 109	13.9	19.3
110 to 119	0.1	3.0
120 to 129	0.3	0.6
130 to 139	1.3	4.7
140 and over	0*	0*

\* 30 miles in 1922 and 49 miles in 1928.

It will be seen that rails under 90-lb. have been going out of vogue, while sections 90 to 109 are great favorites, there being relatively little 110 to 129, but much disposition to lay 130 but under 140.

### Eliminating Speculation in Scrap

**A**LARGE steel company is making a determined effort to eliminate "short selling" of iron and steel scrap so far as its own requirements are concerned. It will not buy any old material that is not owned by the vendor, and thus strikes at the root of one of the problems that has vexed both buyers and sellers of scrap for many years.

It has been customary, as many of our readers know, for the large steel companies to place orders for heavy melting steel and other grades of scrap in tonnage lots with brokers or dealers, and it has mattered little whether the seller was in possession of the material or not. He merely put out buying orders to other brokers and dealers and within a week or longer, as the condition of the market might dictate, had "covered" his contract by dividing the tonnage up among dozens of shippers at prices which in a majority of instances would leave him a profit of about a half-dollar a ton.

It has frequently happened in a rising market, however, that Broker No. 1 has not entirely filled his contract before Broker No. 2 takes an order from another steel company at a higher price, and the second broker is able to pay more to his suppliers than the first broker. Thus, two are virtually com-



peting for the same material, one being able to pay more than the other and still come out with a profit. The illustration is confined to two brokers for the sake of convenience in illustrating the point, when, as a matter of fact, there may be dozens of scrap brokers scrambling for material. Thus, the purchases which steel mills have made actually seem to have been multiplied many times, a factor which accounts in large part for the rapid rise of scrap prices within a brief period when any sort of a buying movement sets in.

A buying movement of fair proportions would undoubtedly bring prices somewhat above those now prevailing, but the scrap market would not be so likely to run away with itself and indulge in violent upward swings if scrap were merchandised on the basis of actual ownership instead of on speculation.

In all probability the scrap trade itself would welcome a change that would tend to minimize or eliminate altogether the speculative risks that attend the taking of "short" orders. A sale of heavy melting steel, for example, which might have been considered a good order at the time it was taken has frequently become a poor order, or, in other words, a losing proposition, before the contract has been fully covered.

The large consumers of steel scrap have not relished the fluctuating costs of their open-hearth melt caused by the ups and downs of scrap prices. They would undoubtedly much prefer a reasonably stable market which would give a fair price to the producer of scrap and a fair profit to the dealer. During the coming year the makers of rolled steel products will be obliged to watch their costs more closely than ever if they are to eke out a reasonable profit, for it does not appear likely that prices of finished steel can be raised sufficiently to make them at all carefree regarding the cost factor. The company which is striving to eliminate "short" dealings in its own transactions is also buying a large amount of unprepared scrap which it prepares in its own scrap yard in an effort to "stabilize" the average cost of the open-hearth charge.

The scrap dealer is a very necessary adjunct of the manufacture of steel, but his methods of doing business must undergo a change. Both buyers and sellers will learn to recognize scrap more as a commodity and less as a speculation.

## CORRESPONDENCE

### Tool Steel Progress in the Twentieth Century

*To the Editor:* With regard to the interesting article by Dr. John A. Mathews on "Tool Steel Progress in the Twentieth Century" published in *THE IRON AGE*, Dec. 4, there are some statements made which cannot pass entirely without being challenged.

With reference to "Oil-Hardening and Other Die Steels," the statement that prior to 1905 there was no oil-hardening die steel is startling, coming from the pen of an expert like Dr. Mathews. Oil-hardening die steels have been used and were known to the writer long before the

date mentioned and it is not likely that they should have been unknown in the United States, which, at the end of the last century, drew most of its high-grade tool steels from England, Sweden, and other countries. Oil-hardening die steels were quite common in Sheffield and were sold long before the date Dr. Mathews mentions by the famous makers of Styrian steel in Austria.

But a much more curious statement is made by the author when he says that the high-carbon high-chromium type of die steel was, to the best of his knowledge, furnished by the Midvale Steel Co. about 15 years ago.

Considering that some of the steels of this grade which Dr. Mathews produces were replicas of steels known and sold in England as far back as 1904 (also patented there by 1911), and sold by Darwin & Milner, Inc., in the United States, it is only fair to make good a regrettable omission in the writings of American metallurgists on the same subject. This deals with the almost pointed disregard of the great achievements by P. R. Kuehnrich of Sheffield, who was the first commercially to produce high-carbon high-chromium steels in Sheffield as far back as 1904, if not somewhat earlier. That these discoveries of P. R. Kuehnrich incidentally blazed the trail for the subsequent discoveries of modern stainless steels merits at least the graceful acknowledgment of our American metallurgists, though very rarely conceded or mentioned in papers on this subject.

The introduction of high-carbon high-chromium steels which are both air and oil-hardening and the tremendous possibilities for quantity production by press tools made from such material was undisputably due to P. R. Kuehnrich, then the chairman of Darwin & Milner, Ltd., Sheffield, and it is high time that metallurgists and tool steel makers in this country, who have benefited so much by the chances which this discovery gave them, should have the grace to recognize Mr. Kuehnrich's merits in this connection.

VICTOR F. J. TLACH

President, Darwin & Milner, Inc.

Cleveland, Ohio.

### Need New Product That Will Bring Popular Demand

*To the Editor:* Now the Railroad Brotherhoods are going to Washington endeavoring to obtain a 6-hr. day but, of course, they expect the same pay for 6 hr. that they already receive for 8 hr. Who is to pay the added cost but the poor public, which means everybody, rich and poor alike.

The present luxuries we all enjoy do not come from the short work-day but from real hard work and study by those in executive positions. While the work-day has been shortened from that of boyhood days or earlier, there is a limit to how short it can be made and have our country prosperous.

Apparently, what is most needed to have prosperity again is for someone to devise something that everyone will want to buy and will sacrifice to buy. This would set the wheels of industry in motion and ultimately get all employed.

One of the pressing needs in the summer is a method of cooling at least one room in every house. Those of us who visited banks, etc., in the summer, where a refrigerating apparatus was in use know the pleasure of this after being out in the hot sunshine.

We hope soon someone will come forward with devices or machines or other utilities which will bring back economic prosperity.

W. S. DAVENPORT,

President and General Manager,  
Davenport Machine Tool Co.

Rochester, N. Y.

## Forward Buying Movement Shows Further Expansion

CONSIDERABLE First Quarter Contracting in Pig Iron and Sheets — Steel Specifications Being Placed for January Delivery.

**F**URTHER expansion of forward contracting is the significant feature of the current situation in iron and steel. While buyers are still extremely conservative in estimating their requirements in coming months and lean to the view that business activity will show gradual, rather than sharp, recovery, there is increasing evidence of their belief that the market is scraping bottom and that the next major change in the price trend will be upward.

Pig iron contracting has continued active at Chicago and New York, where melters have covered 60 per cent of their first quarter needs, and has shown improvement at Cleveland, where bookings of the week total 22,000 tons. Considerable tonnage also has been placed for the entire first half of 1931, and in a few cases protection throughout 1931 has been asked. The American Radiator & Standard Sanitary Corporation, which last month bought 50,000 tons of pig iron, has made additional purchases which raise its total contract commitments to 75,000 tons. A large automobile maker is trying to contract for its castings at present prices until the end of the third quarter, while an automotive foundry unsuccessfully attempted to buy its entire 1931 coke requirements at the current market.

Sheet contracting is in impressive volume and at Chicago is described as the heaviest in 15 months. It develops that the recent advance of \$1 a ton on bars, plates and shapes had the customary effect of driving in considerable tonnage at the previous prices, with the result that many of the larger buyers are covered through most of the first quarter at 1.60c. a lb., Pittsburgh. Efforts to contract for these products through the first half of 1931 have been unsuccessful.

While steel contracts, in contrast with those for pig iron, are of an optional character and permit buyers to cancel tonnage that remains unspecified, the desire of the trade to obtain protection is an earnest of that confidence in prices that is prerequisite to a change in the business trend.

Most of the larger users of tin plate are now under contract for 1931 and, while specifications are still light, a number of producers are beginning to roll anticipated tonnage. Tin mill output has gained for the second consecutive week, now averaging 50 per cent.

Rails placed during the week total 35,500 tons, including 20,000 tons for the Louisville & Nashville, 10,500 tons for the Wabash and 5000 tons for the Chicago Great Western. Railroad equipment buying is featured by the purchase by the Santa Fe of 1522 freight

cars, requiring 20,000 tons of steel for the superstructures alone.

Rail mill operations at Chicago have risen to 50 per cent of capacity, compared with 40 per cent a week ago. Rails and tin plate are the only finished steel products that are showing an expansion in output this month. Generally speaking, steel specifications for December shipment are shrinking steadily with the approach of the year-end holiday and inventory suspensions of steel-consuming industries. Steel ingot output for the country at large is unchanged from last week at 38 per cent, but further curtailment is in prospect during the holiday weeks.

While business for December shipment is declining, specifications are beginning to be received for steel to be delivered in January and the volume of these releases is expected to increase in the next fortnight.

The scrap market, which is always closely watched as a barometer, remains quiet and without a well defined trend. However, the protracted decline in prices seems to be arrested. While heavy melting steel, the most important grade, remains unchanged in price, there have been scattered advances in minor items, notably at Pittsburgh and St. Louis. Dealers in the latter center have been laying down scrap in their yards for several weeks, one of them having accumulated the largest stocks in five years.

Demand for cast iron pipe has been stimulated by efforts of municipalities to rush construction work as a means of relieving unemployment. Detroit has taken bids on 11,000 tons and Milwaukee is in the market for 6000 tons. Some prospective contracts in the South have been tied up by bank suspensions.

Fabricated structural steel contracts total 29,500 tons, compared with a weekly average of 34,000 tons since September. The large amount of pending work has been augmented by inquiries for 23,500 tons.

Electrolytic copper has again declined. Following a reduction in the quotations of custom smelters to 10c. a lb., Connecticut valley, producers reduced their price to 10½c. Spot Straits tin sold Monday at 23¾c. a lb., New York, the lowest price in more than 25 years. Prime Western zinc has also receded, now ranging from 4c. to 4.05c., East St. Louis, or very close to the low point of 3.95c. reached several weeks ago.

THE IRON AGE composite prices for finished steel and heavy melting scrap remain unchanged at 2.121c. a lb. and \$11.25 a gross ton respectively. Pig iron has undergone further slight reduction, declining from \$16.02 to \$15.90 a gross ton, the lowest level in 15 years.



# PITTSBURGH

## Price Stabilization Has Stimulated Forward Contracting for Steel

PITTSBURGH, Dec. 16.—Recent efforts toward stabilizing finished steel prices have stimulated forward contracting with mills in this district, in the face of the lightest current demand of the year. Makers of bars, plates and shapes have met with considerable success in negotiating first quarter contracts with their regular customers, and the recently established 1.65c., Pittsburgh, price has been the ruling quotation on most of the smaller tonnages. While contracts for plates and shapes are reported to have been closed in a few instances at the old price of 1.60c., Pittsburgh, this figure probably represents the absolute minimum on first quarter tonnage. As a result, steel companies will likely realize \$1 to \$2 a ton more on their heavy hot-rolled shipments than they are doing at the present time.

Some of the specifications coming in today are against low-priced contracts which expire this month, and the steel obtained will not go directly into consumption. Contracting has been even heavier in sheets in spite of the fact that no price increase is immediately in prospect. However, consumers seem to feel the market has reached bottom, and that protection during the first quarter at present prices is a convenience which would be profitable in case of a price advance. If the material is not needed, the contract can easily be canceled.

On the other lines of finished steel products little change is reported. In some cases, specifications so far this month have been equal to those of the corresponding November period, but declines in tonnage releases can hardly be avoided over the remainder of the year. It is reported that most of the large consumers of tin plate are now under contract for 1931 and, with one exception, all the larger railroads in this territory have either placed contracts or are negotiating for their next year's rail requirements. Track accessories are expected to come later.

Structural lettings have not been heavy in recent weeks, but mills are still fairly well occupied on old contracts. Railroad car builders in the district have taken little recent business, but considerable car building steel is in prospect from the carriers themselves, as they are making efforts to keep their shops occupied.

Shipments to the automotive industry have been at a low point, but will increase before the end of the month as Detroit companies prepare for January operations. The leading maker of low-priced cars has suspended activity in most of its departments until

Contracting for steel for first quarter proceeds at fair rate despite smallest current demand of year.

\* \* \*

Commitments on bars, plates and shapes range from 1.60c. a lb. for larger users to 1.65c. on smaller tonnages.

\* \* \*

Shipments of steel to automobile industry expected to increase by end of month.

\* \* \*

Mills preparing for almost complete suspension during holiday week.

\* \* \*

Scattered sales of miscellaneous grades of scrap made at an advance in prices.

Jan. 5, and parts makers serving it will do likewise.

Operations in the Pittsburgh district are not materially lower this week, with the average between 35 and 40 per cent of capacity. One or two of the smaller independent companies have increased their open-hearth furnace engagement preparatory to complete suspension for Christmas week and some of the larger mills will be entirely idle during the period. In the Youngstown district only one independent steel company blast furnace is active, and the only merchant furnace now operating in the Valleys will be banked at the end of the week. Open-hearth operations in that territory will also practically come to a standstill next week.

Among finished steel products, tin plate alone shows a gain over the preceding week, with the industry now engaged at more than 50 per cent of capacity.

### Pig Iron

Some of the merchant pig iron interests in this district have taken a number of first quarter contracts, but such business has come principally from the small users. Consumer interest is not especially active, although shipments so far this month have been at a fair rate. In the next two weeks, however, foundry operations are scheduled to decline sharply for inventory taking, and the month will probably fall under November in total movement. The Westinghouse Electric & Mfg. Co. has closed against its recent inquiry for first quarter, and is reported to have divided the iron among a number of

sellers. No large inquiries have appeared, and buying is of a quiet nature.

The price of foundry iron is maintained in the Valleys at \$17, furnace, with the Pittsburgh maker quoting 50c. a ton more. Bessemer and malleable iron are unchanged at \$17.50, Valley furnace, and \$18, Neville Island. With no transactions to test the market, basic is unchanged at \$17, Valley, and \$17.50, Pittsburgh furnace.

The remaining active stack of the Shenango Furnace Co. in the Valleys will be banked at the end of this week, leaving no active merchant units operating in that territory.

Prices per gross ton, f.o.b. Valley furnace:

Basic .....	\$17.00
Bessemer .....	17.50
Gray forge .....	16.50
No. 2 foundry .....	17.00
No. 3 foundry .....	16.50
Malleable .....	17.50
Low phos., copper free .....	\$26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, \$1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic .....	\$17.50
No. 2 foundry .....	17.50
No. 3 foundry .....	17.00
Malleable .....	18.00
Bessemer .....	18.00

Freight rates to points in Pittsburgh district range from 63c. to \$1.13.

### Semi-Finished Steel

Despite the report of a reduction of \$1 a ton in the price of billets, slabs and sheet bars at Cleveland for first quarter contracting, Pittsburgh mills have not yet opened their books for that period, and in the absence of sales the market is nominally unchanged at \$31, Pittsburgh or Youngstown. It is not unlikely that a change in the official base price will be made in the next few days, but as scarcely any tonnage is sold at this figure, a change in the official price is significant only in its effect upon differentials enjoyed by the various consumers. Makers of forging billets have taken some contracts for first quarter at \$36, Pittsburgh. Shipments of semi-finished material are generally light, as the operations of the smaller non-integrated mills are more adversely affected than those of the larger units. Wire rods are now generally offered at \$35, Pittsburgh or Cleveland, and contracts are being made on that basis.

### Rails and Track Accessories

Promise of rail buying before the end of the year by the two largest Eastern roads has given the market a brighter outlook, although few inquiries for accessories are coming out and current specifications are very light. The New York Central is ex-

## A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous,  
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Dec. 16, 1930	Dec. 9, 1930	Nov. 18, 1930	Dec. 17, 1929
No. 2 fdy., Philadelphia.....	\$17.76	\$17.76	\$18.26	\$20.76
No. 2, Valley furnace.....	17.00	17.00	17.00	18.50
No. 2 Southern, Cin'tl.....	14.19	14.69	14.69	17.69
No. 2, Birmingham.....	14.00	14.00	14.00	14.50
No. 2 foundry, Chicago*.....	17.50	17.50	17.50	20.00
Basic, del'd eastern Pa.....	17.75	17.75	17.75	19.50
Basic, Valley furnace.....	17.00	17.00	17.00	18.50
Valley Bessemer, del'd P'gh.....	19.26	19.26	19.26	20.76
Malleable, Chicago*.....	17.50	17.50	17.50	20.00
Malleable, Valley.....	17.50	17.50	17.50	19.00
L. S. charcoal, Chicago.....	27.04	27.04	27.04	27.04
Ferromanganese, furnace.....	80.00	80.00	94.00	100.00

Rails, Billets, etc., Per Gross Ton:				
Rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh..	31.00	31.00	31.00	35.00
Sheet bars, Pittsburgh.....	31.00	31.00	31.00	35.00
Slabs, Pittsburgh.....	31.00	31.00	31.00	35.00
Forging billets, Pittsburgh.....	36.00	36.00	36.00	40.00
Wire rods, Pittsburgh.....	35.00	35.00	36.00	40.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb...	1.60	1.60	1.60	1.85

Finished Steel,				
<i>Per Lb. to Large Buyers:</i>	Cents	Cents	Cents	Cents
Bars, Pittsburgh.....	1.60	1.60	1.60	1.90
Bars, Chicago.....	1.70	1.70	1.70	2.00
Bars, Cleveland.....	1.65	1.65	1.65	1.90
Bars, New York.....	1.93	1.93	1.93	2.24
Tank plates, Pittsburgh.....	1.60	1.60	1.60	1.90
Tank plates, Chicago.....	1.70	1.70	1.70	2.00
Tank plates, New York.....	1.88	1.88	1.88	2.17 1/2
Structural shapes, Pittsburgh.....	1.60	1.60	1.60	1.90
Structural shapes, Chicago.....	1.70	1.70	1.70	2.00
Structural shapes, New York.....	1.85 1/2	1.85 1/2	1.85 1/2	2.09 1/2
Cold-finished bars, Pittsburgh.....	2.00	2.00	2.00	2.30
Hot-rolled strips, Pittsburgh.....	1.55	1.55	1.55	1.90
Cold-rolled strips, Pittsburgh.....	2.25	2.25	2.35	2.75

\*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Finished Steel.	Dec. 16, 1930	Dec. 3, 1930	Nov. 18, 1930	Dec. 17, 1929
<i>Per Lb. to Large Buyers:</i>	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh...	2.35	2.35	2.35	2.75
Sheets, black, No. 24, Chicago dist. mill. ....	2.45	2.45	2.45	2.75
Sheets, galv., No. 24, P'gh...	2.90	2.95	2.95	3.40
Sheets, galv., No. 24, Chicago dist. mill. ....	3.00	3.10	3.10	3.50
Sheets, blue, No. 13, P'gh...	2.05	2.05	2.05	2.35
Sheets, blue, No. 13, Chicago dist. mill. ....	2.15	2.15	2.15	2.45
Wire nails, Pittsburgh.....	1.90	1.90	1.90	2.40
Wire nails, Chicago dist. mill.	1.95	1.95	2.00	2.45
Plain wire, Pittsburgh.....	2.20	2.20	2.30	2.40
Plain wire, Chicago dist. mill.	2.25	2.25	2.35	2.45
Barbed wire, galv., Pittsburgh	2.55	2.60	2.60	3.05
Barbed wire, galv., Chicago dist. mill. ....	2.65	2.75	2.75	3.10
Tin plate, 100 lb. box, P'gh...	\$5.00	\$5.00	\$5.00	\$5.35

Old Material, Per Gross Ton :				
Heavy melting steel, P'gh.....	\$12.75	\$12.75	\$13.00	\$15.25
Heavy melting steel, Phila.....	11.00	11.00	12.00	14.50
Heavy melting steel, Ch'go.....	10.00	10.00	10.00	12.50
Carwheels, Chicago.....	11.75	11.75	11.75	13.50
Carwheels, Philadelphia.....	14.00	14.00	14.00	15.50
No. 1 cast, Pittsburgh.....	12.50	12.50	12.50	14.50
No. 1 cast, Philadelphia.....	12.00	12.00	12.00	15.00
No. 1 cast, Ch'go (net ton).....	9.50	9.50	9.50	13.50
No. 1 RR. wrot., Phila.....	13.50	13.50	13.50	15.50
No. 1 RR. wrot., Ch'go (net).....	8.50	8.50	8.50	12.00

Coke, Connellsville,	Per Net Ton at Oven:			
Furnace coke, prompt.....	\$2.50	\$2.50	\$2.50	\$2.65
Foundry coke, prompt.....	3.50	3.50	3.50	3.75

Metals,				
<i>Per Lb. to Large Buyers :</i>				
	Cents	Cents	Cents	Cents
Lake copper, New York.....	10.62½	12.12½	12.12½	18.12½
Electrolytic copper, refinery...	9.75	10.75	10.75	17.75
Tin (Strait), New York.....	23.75	25.00	25.75	41.30
Zinc, East St. Louis.....	4.00	4.20	4.20½	5.50
New York.....	4.35	4.55	4.67½	5.85
Lead, St. Louis.....	4.95	4.95	4.95	6.10
Lead, New York.....	5.10	5.10	5.10	6.25
Antimony (Asiatic), N. Y....	7.10	7.10	7.12½	8.50

pected to announce the allocation of its rail requirements in the next few days, the total being 170,000 tons. The tonnage of the Pennsylvania has not been announced. The Baltimore & Ohio has inquired for 7500 kegs of spikes, but has not yet come into the market for tie plates, ordinarily bought at the same time. The Louisville & Nashville is reported to have placed 6000 kegs of spikes, on which it took bids Dec. 2, with the Southern maker. Business in light rails is very dull.

## Bars, Plates and Shapes

The recent advance in prices on bars, plates and shapes to 1.65c., Pittsburgh, for first quarter delivery, has been successful in driving in a number of contracts. Current releases, however, are very light, and specifications against structural contracts awarded earlier in the year constitute the bulk of current shipments. Recently, fabricated structural steel awards have been light in this district, although the American Bridge Co. has taken 5300 tons for a bridge over the Ohio River at Evansville, Ind., on which it was low bidder several weeks ago. Barge builders are working on the inquiry of the Inland

Waterways Corp'n. for 50 barges and four tow boats, on which bids will be taken later in the month. Little other sizable business is before the market, and not much more is expected before the first of the year. Specifications for bars are exceptionally light, and operations are not above 35 per cent of theoretical capacity. Plate and shape mills are running somewhat better.

## Tubular Goods

Pipe mill operations have declined to the lowest point of the year, with such activity as there is confined almost entirely to seamless and electric welding units. Most of the lapweld capacity in the district is idle, and butt weld mills are not running at more than 25 per cent. Shipments to the oil country are holding at about the rate which prevailed in November, but distributors' stocks in that region are ample, and substantial volume is lacking. Mechanical tubing continues very dull, and boiler tubes have fallen off somewhat in recent weeks. Locomotive tubing is in fair demand. A number of sizable line pipe projects are already said to be in prospect for early 1931 letting, but details are closely guarded, pending

financing and procurement of rights  
of way.

## Wire Products

Makers of wire nails are soliciting first quarter contracts and meeting with fair success, especially on merchant wire products, on which the price is exceptionally low. Nevertheless, nails are well maintained at \$1.90 and \$2 a keg, the lower price applying only to the jobbing trade. While talk of an advance is heard, no action is expected until buyers are generally covered for the first three months of the year. The official first quarter price on manufacturer's wire is 2.30c., Pittsburgh, although naturally no attempt has been made to change the price to customers who had contracted at 2.20c. before the first quarter figure was announced. Current tonnage is also moving at 2.20c. in most cases, although shipments against a number of older contracts at the higher price are yet to be completed. Spring wire is unchanged for first quarter at 3.30c., Pittsburgh.

## Sheets

The impressive volume of first quarter contracting is the feature of the sheet market. While smaller



# THE IRON AGE COMPOSITE PRICES

Finished Steel		Pig Iron		Steel Scrap	
Dec. 16, 1930	2.121c. a Lb.	\$15.90 a Gross Ton		\$11.25 a Gross Ton	
One week ago	2.121c.	16.02		11.25	
One month ago	2.135c.	16.13		11.67	
One year ago	2.362c.	18.21		14.08	
Based on steel bars, beams, tank plates, pipe, rails, black pipe and sheets. These products make 87 per cent of the United States output.		Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.		Based on heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.	
HIGH		LOW		HIGH	
1930.....	2.362c., Jan. 7:	2.121c., Dec. 9	\$18.21, Jan. 7:	\$15.00, Feb. 18:	\$11.42, Dec. 9
1929.....	2.412c., April 2:	2.362c., Oct. 29	18.71, May 14:	17.58, Jan. 29:	14.08, Dec. 3
1928.....	2.391c., Dec. 11:	2.314c., Jan. 3	18.59, Nov. 27:	16.50, Dec. 31:	13.08, July 2
1927.....	2.453c., Jan. 4:	2.293c., Oct. 25	19.71, Jan. 4:	15.25, Jan. 11:	13.08, Nov. 22
1926.....	2.453c., Jan. 5:	2.403c., May 18	21.54, Jan. 5:	17.25, Jan. 5:	14.00, June 1
1925.....	2.560c., Jan. 6:	2.396c., Aug. 18	22.50, Jan. 13:	20.83, Jan. 13:	15.08, May 5

consumers predominate among those entering future business, larger users are also showing interest and reports of a probable price advance after the first of the year are proving a helpful factor. The low level of prices is nevertheless the most decisive element in the situation, and the average consumer feels that he is no longer in danger of loss because of lower quotations. If general business conditions do not warrant specifications against contracts for manufacturing purposes, the obligations may be cancelled without loss to either party. For this reason the size of contracts throw little light on the trend of business in the early months of the new year and is encouraging only from the price standpoint. Prices generally reflect considerable stability. While a diminishing amount of business is being done at the higher side of the price ranges, minimum figures seem to be stronger than before. Current operations are averaging about 35 per cent of theoretical capacity, with the leading interest scheduled at 40 per cent this week and a number of smaller independent units entirely suspended for the remainder of the year.

## Tin Plate

Most of the larger users of tin plate are now under contract for 1931, and deviations from the official price have been no more numerous than usual. Specifications are light, but a number of companies have been able to begin rolling anticipated tonnage and the average operating rate of the industry shows a gain for the second consecutive week. Current activity is estimated at about 50 per cent of capacity, with the leading interest running at a slightly higher rate. Nearly all of the independents report limited gains.

## Strip Steel

First quarter contracting for strip steel is hardly as active as in sheets, but a number of buyers have entered tonnage for that period and manufacturers are having little difficulty in getting the remainder in line. The low level of price is often the deciding factor, but some users anticipate a rather substantial gain in their requirements before the new year is far

advanced. Prospects of the automobile industry are not as hopeful as they might be. The leading producer of cars in the low-priced field has suspended production in most of its departments until Jan. 5 and parts makers are correspondingly inactive. One or two motor car builders are still maintaining a fair production and these same companies hope to increase their schedules during January. In some cases shipments for this purpose will go forward this month. Prices are well maintained on both current and contract tonnage.

## Coke

Despite intermittent cold weather, demand for heating coke has not developed sustained strength and business in the other grades of coke is very dull. Furnace coke is still quotable at \$2.50, Connellsville, with occasional spot sales at higher figures. Shipments of foundry coke have been running ahead of those of November so far this month with some companies, but are expected to decline

sharply in the next two weeks. Demand for domestic coal is dull and industrial requirements are light.

## Old Material

Sales of approximately 2000 tons of borings and turnings to a local merchant furnace interest at \$8.50 have advanced the price of the blast furnace grades, which had hitherto been quoted at \$7 to \$7.50. However, recent small sales have also been made at \$7.50, and the market is quotable at a \$1 range. Specialties continue active and are scarce. Steel wheels in particular are hard to buy, and dealers are offering \$16.25 and even more to cover old contracts. The other low phosphorus grades are correspondingly strong. The market on No. 1 heavy melting scrap is unchanged. As it is not likely that a mill could place an order for a significant tonnage at less than \$13, the market is still nominally quoted at \$12.50 to \$13. The other basic open-hearth grades also are unchanged. One mill is reported to have bought compressed sheets at \$12.50.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

## Warehouse Prices, f.o.b. Pittsburgh

*Base per Lb.	
Plates.....	2.85c.
Structural shapes.....	2.85c.
Soft steel bars and small shapes.....	2.75c.
Reinforcing steel bars.....	2.75c.
Cold finished and screw stock—	
Rounds and hexagons.....	3.35c.
Squares and flats.....	3.85c.
Bands.....	3.10c.
Hoops.....	4.10c.
Black sheets (No. 24), 25 or more bundles.....	3.25c.
Galv. sheets (No. 24), 25 or more bundles.....	3.85c.
Light plates, blue annealed (No. 10), 1 to 24 plates.....	2.75c.
Blue annealed sheets (No. 13).....	2.65c.
Galv. corrug. sheets (No. 28), per square.....	4.25c.
Spikes, large.....	2.65c.
Small.....	2.90c. to 3.05c.
Boat.....	3.15c.
Track bolts, all sizes, per 100 count, 60 and 10 per cent off list	
Machine bolts, 100 count, 60 and 10 per cent off list	
Carriage bolts, 100 count, 60 and 10 per cent off list	
Nuts, all styles, 100 count, 60 and 10 per cent off list	
Large rivets, base per 100 lb.....	\$3.30
Wire, black, soft ann'd, base per 100 lb.....	2.40
Wire, galv. soft, base per 100 lb.....	2.85
Common wire nails, per keg.....	2.15
Cement coated nails, per keg.....	2.15

\*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 3999 lb.

Basic Open-Hearth Grades:	
No. 1 heavy melting steel.....	\$12.50 to \$13.00
No. 2 heavy melting steel.....	10.50 to 11.00
Scrap rails.....	12.00 to 12.50
Compressed sheet steel.....	12.00 to 12.50
Bundled sheets, sides and ends.....	10.00 to 10.50
Cast iron car wheels.....	13.50 to 14.00
Sheet bar crops, ordinary.....	13.50 to 14.00
Heavy breakable cast.....	9.00 to 9.50
No. 2 railroad wrought.....	12.50 to 13.00
Hvy. steel axle turnings.....	10.50 to 11.00
Machine shop turnings.....	6.00 to 6.50
Acid Open-Hearth Grades:	
Railr. knuckles and couplers.....	16.00 to 16.50
Railr. coil and leaf springs.....	16.00 to 16.50
Rolled steel wheels.....	16.00 to 16.50
Low phos. billet and bloom ends.....	17.00 to 18.00
Low phos. mill plates.....	15.50 to 16.00
Low phos. light grades.....	15.50 to 16.00
Low phos. sheet bar crops.....	16.50 to 17.00
Heavy steel axle turnings.....	10.50 to 11.00
Electric Furnace Grades:	
Low phos. punchings.....	15.50 to 16.00
Heavy steel axle turnings.....	10.50 to 11.00
Blast Furnace Grades:	
Short shoveling steel turnings.....	7.50 to 8.50
Short mixed borings and turnings.....	7.50 to 8.50
Cast iron borings.....	7.50 to 8.50
Rolling Mill Grades:	
Steel car axles.....	18.00 to 18.50
Cupola Grades:	
No. 1 cast.....	12.00 to 13.00
Rails 3 ft. and under.....	14.00 to 14.50

# CHICAGO

## Interest in Steel Trade Centers in First Quarter Contracting

CHICAGO, Dec. 16.—Specifications for iron and steel are tapering, as is to be expected at this time of year, and interest is centering in progress being made in signing commitments for the coming three months. Probably the greatest activity is shown in sheets, sellers of which are experiencing a major buying movement that has not been equaled in 15 months. The urge to fill order books is not without willingness to accept lower prices, as is evidenced by reductions of \$2 a ton on the galvanized product and a more general acceptance of the lower figure of the spread on black sheets. Some attractive business has been placed with wire mills. Pig iron contracting has made further progress, with undiminished interest shown by new inquiries.

The finished steel market is relatively quiet, as many sellers carefully combed the trade before the recent price advance. It seems evident that much of the movement of plates, shapes and bars in the next three months will be on contracts made at 1.70c. a lb., Chicago.

Demand for steel products is being pushed down by seasonal influences. Ingot output has settled several points to an average of 40 per cent of capacity. Wire mill output, at 35 to 40 per cent of capacity, is from 5 to 10 per cent more than shipments would dictate. Sheet mill operations have dropped from 5 to 10 per cent. However, there is a brighter side to the picture. Specifications for shipment after Jan. 1 are in substantial volume, considering the business situation as a whole.

### Ferroalloys

Forward contracting in these commodities is making rapid progress. Ferromanganese quotations are steady at \$80 to \$85 a ton, seaboard, depending on the tonnage. Ferrosilicon is openly quoted at \$83.50 a ton, delivered on contract, and at \$88.50 a ton for spot shipment, but irregularities of \$2 to \$3 a ton are reported on offerings made at Chicago and Milwaukee by Canadian sellers.

### Pig Iron

The buying movement which started several weeks ago continues to move at an undiminished stride. Probably not far from 60 per cent of first quarter contracts have been closed, and a sizable tonnage has been taken for the first half. Purchasing is being done in an orderly fashion. There is a fairly steady inflow of fresh inquiries. December shipments of Northern iron are tapering, whereas

Specifications for steel and pig iron for immediate shipment tapering, and interest is centered in contracting for first quarter.

\* \* \*

Brightest side of picture is that specifications for January shipment are in fairly substantial volume.

\* \* \*

Mills generally willing to accept minimum of price spread. Galvanized sheets have settled to 3c., Chicago district mill.

\* \* \*

Pig iron contracting proceeding, with undiminished interest shown by fresh inquiries.

\* \* \*

Ingot output has settled several points to about 40 per cent of capacity.

releases for shipments after Jan. 1 are accumulating in sufficient volume to lead sellers to believe that January deliveries will show an upturn. Silvery contracting is probably 80 per cent completed, with prices showing some irregularity. From 6000 to 8000 tons of this commodity remains on Chicago docks.

### Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	\$17.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	18.00
Malleable, not over 2.25 sil.	17.50
High phosphorus	17.50
Lake Super. charcoal, sil. 1.50	27.04
S'th'n No. 2 fdy.	17.51
Low phos., sil. 1 to 2 cop-per free	\$28.50 to 29.20
Silvery, sil. 8 per cent.	26.79
Bess. ferrosilicon, 14-15 per cent	35.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

### Plates

Outstanding in current news of railroad activity is the Santa Fe's action in closing orders for 1522 freight cars, requiring about 20,000 tons of steel for the superstructures. These orders were well distributed among Western shops, all but one of which had practically ceased to operate because of lack of business. The inquiry of the Chicago & Illinois Midland is still before the trade, and the impression is that the cars will be purchased. Reports are persistent that the Milwaukee Road will soon be in

the market, though officials of this railroad will not comment. The possibility of the Illinois Central taking figures overhangs the market, and several smaller Western railroads have tentative plans for car purchases. The rebuilding program of the Great Northern is said to be well under way, the necessary steel having been received by boat from Lake Erie ports.

An inquiry is out from the Inland Waterways Corp. for 25,000 tons of plates and shapes for 50 barges. During recent weeks contracts for oil storage tanks have been scattered and have involved rather small tonnages of steel. However, a number of sizable projects are in the making. Two inquiries call for 9000 tons of steel, which will be shipped to the Southwest. Tank shops are busy and continue to enter attractive specifications. Western welded pipe manufacturers are holding operations to a uniform rate and thereby are lending substantial aid to rolling schedules of local mills. Forward contracting has made little headway at 1.75c. a lb., Chicago, for the reason that many sellers covered at 1.70c., which is quite evidently the quotation at which the bulk of plates will move during first quarter.

### Structural Material

Once again there appears to be ground for the belief that the structural market will gain in activity in the near future. A number of old projects are being revived, and several of the leading architects have some attractive new work on their boards. Among the revivals is the Marshall Field Estate Building, which may be erected in sections and which when complete will have made use of about 27,000 tons of steel.

Efforts are being made to speed the plans for the Chicago Post Office, which may take upward of 50,000 tons of steel. The subway plans have been approved by the Chicago city council.

The steel trade and local engineers feel greater assurance that the end of the dull building period is in sight.

### Bars

Specifications for bar mill products have failed to make further gains. This is contrary to conditions in late November and early December, but is no doubt accounted for by the fact that industry is gradually tapering to the year-end shutdown. Specifications for mild steel bars are well diversified but lighter than they were in the first week of December.

New buying is lagging in view of the fact that most sellers had combed



the market for next year's contracts at 1.70c. a lb., Chicago.

The bar iron market continues to drag in the absence of major car building programs by the railroads. Orders recently placed were for small lots for minor car repairs. The rail steel bar market is quiet and still somewhat irregular as to the price structure. With one mill idle for major alterations, output is not above 25 per cent of the capacity in this district.

### Wire Products

Shipments from local mills range from 35 to 40 per cent of capacity, while the rate of production is in the range of 40 to 45 per cent. This overproduction is being used to round out lines for the spring trade. Contracting for the first quarter is moving faster and there is already a fair tonnage on producers' books. Specifications from the jobbing trade remain fairly steady, but dealers' needs are tapering. A number of large contracts have been closed for copper cable.

### Hot-Rolled Strip

Specifications are supporting local mills at 40 per cent of capacity, but it can reasonably be expected that this rate will fall in the last two weeks in December.

### Rails and Track Supplies

New rail orders total 35,500 tons. The Louisville & Nashville has placed 20,000 tons with the Illinois Steel Co., the Chicago Great Western has given 3000 tons to the Illinois Steel Co. and 2000 tons to the Inland Steel Co.; the Wabash has ordered 10,500 tons.

Releases against rail contracts continue to grow, permitting local mills to gain another 10 points to an output of 50 per cent of capacity.

*Prices f.o.b. mill, per gross ton:* Standard section open-hearth and Bess. rails, \$43; light rails, rolled from billets, \$36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 1.95c.; angle bars, 2.75c.

### Bolts, Nuts and Rivets

Forward contracting is well advanced and prices are steady. Specifications are tapering, as is customary at this time of year. However, a bright spot appears in heavier releases entered by the farm implement manufacturers, who are signifying their intention to make larger use of these commodities after Jan. 1.

### Cast Iron Pipe

Quotations on French pipe are low on 4000 tons at Detroit. James B. Clow & Sons are low on 1100 tons, and Lynchburg Foundry Co. and Glamorgan Pipe & Foundry Co. also, have low figures on parts of the tonnage. Detroit's inquiry was for a total of 11,000 tons. One bid by an American maker was \$37.15 a ton, delivered Detroit, which is equivalent to \$28.75 a ton, Birmingham, the low price having been brought out by foreign-made pipe competition.

Milwaukee is in the market for 6000 tons of cast iron pipe in various sizes, and St. Cloud, Minn., will buy 600 tons of 6 to 16-in. pipe.

*Prices per net ton, deliv'd Chicago:* Water pipe, 6-in. and over, \$44 to \$46; 4-in., \$47 to \$49; Class A and gas pipe, \$3 extra.

### Sheets

Contracting for the first quarter is making rapid strides, with the result that some sellers report order books that at this date are very close to normal. In fact, the buying movement can be characterized as the best in 15 months and it is still under way. Buyers have succeeded in breaking through the 3.15c. a lb., Chicago, quotation on galvanized sheets, which are now quotable at 3.05c. to 3.15c., the lower price being obtainable on large quantities. Likewise, black sheet quotations show some irregularity, with 2.50c., Chicago, the ruling quotation. Operations are tapering, the range now being from 35 to 40 per cent of capacity.

*Base prices per lb., deliv'd from mill in Chicago:* No. 24 black sheets, 2.50c. to 2.60c.; No. 24 galv., 3.05c. to 3.15c.; No. 10 blue ann'd, 2.05c. to 2.15c. *Deliv'd prices* at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

### Old Material

News in this market is mixed. Several large users of heavy melting steel have cut shipments, and the melt in most directions is lower. On the other hand, a few scattered sales of a number of grades indicate that some users are willing to pay above current price levels if their specifications are closely met. For instance, a fair tonnage of heavy melting steel has been sold to a consumer at \$11 a ton, delivered. Likewise, cast iron borings have been taken for delivery out of town at the equivalent of \$6 a ton,

delivered Chicago, and a user to the southeast is offering the equivalent of \$14.90 a ton, Chicago, for 500 tons of special short rails.

Dull industrial activity, cold weather and snow are all playing a part in curtailment of scrap gathering and preparation. Among railroad lists are 1200 tons offered by the Chicago & Alton, 1500 tons by the Rock Island, 3000 tons by the Grand Trunk and 2500 tons by the Burlington.

*Prices deliv'd Chicago district consumers:*  
*Per Gross Ton*

Basic Open-Hearth Grades:	
Heavy melting steel.....	\$10.00 to \$10.50
Shoveling steel.....	10.00 to 10.50
Frogs, switches and guards, cut apart, and misc. rails	11.25 to 11.75
Factory hyd. comp. sheets	8.50 to 9.00
Drop forge flashings.....	7.75 to 8.25
No. 1 busheling.....	7.50 to 8.00
Forg'd cast and r'd steel carwheels	13.50 to 14.00
Railroad tires, charg. box size	13.50 to 14.00
Railroad leaf springs cut apart	13.50 to 14.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	12.00 to 12.50
Coll. springs	13.50 to 14.00
Electric Furnace Grades:	
Axle turnings	9.25 to 9.75
Low phos. punchings.....	11.50 to 12.00
Low phos. plates, 12 in. and under	11.50 to 12.00
Blast Furnace Grades:	
Axle turnings	5.25 to 5.75
Cast iron borings	5.50 to 6.00
Short shoveling turnings..	5.00 to 5.50
Machine shop turnings....	4.25 to 4.75
Rolling Mill Grades:	
Iron rails	11.00 to 11.50
Rerolling rails	12.50 to 13.00
Cupola Grades:	
Steel rails, less than 3 ft..	12.50 to 13.00
Steel rails, less than 2 ft..	13.50 to 14.00
Angle bars, steel.....	11.75 to 12.25
Cast iron carwheels.....	11.75 to 12.25
Malleable Grades:	
Railroad	12.25 to 12.75
Agricultural	11.25 to 11.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heavier	26.00 to 31.00

Per Net Ton	
Rolling Mill Grades:	
Iron angle and splice bars.	10.50 to 11.00
Iron arch bars, and transoms	11.00 to 11.50
Iron car axles	20.00 to 21.00
Steel car axles	13.00 to 13.50
No. 1 railroad wrought...	8.50 to 9.00
No. 2 railroad wrought...	8.75 to 9.25
No. 1 busheling	6.50 to 7.00
No. 2 busheling	4.50 to 5.00
Locomotive tires, smooth..	12.50 to 13.00
Pipes and flues	5.50 to 6.00
Cupola Grades:	
No. 1 machinery cast....	9.50 to 10.00
No. 1 railroad cast.....	9.00 to 9.50
No. 1 agricultural cast....	8.50 to 9.00
Stove plate	7.50 to 8.00
Grate bars	7.00 to 7.50
Brake shoes	7.25 to 7.75

\*Relaying rails, including angle bars to match are quoted f.o.b. dealers' yards.

### Reinforcing Bars

This market continues to drift. Though not yet a definite inquiry, there is good prospect that Chicago will soon take figures on 2400 tons for the Ogden Avenue viaduct. The general run of inquiries is for carloads and less. This is also true of sales, which do not support shop operations at the low rate of 30 per cent of capacity. It is quite evident that the end of December will not

(Concluded on page 1896)

### Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes.....	3.00c.
Soft steel bars	2.90c.
Reinforcing bars, billet steel.....	1.70c.
Rail steel reinforcement.....	1.50c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons.....	3.35c.
Flats and squares.....	3.85c.
Bands $\frac{1}{4}$ in. (In. Nos. 10 and 12 gages)	3.10c.
Hoops (No. 14 gage and lighter)..	3.65c.
Black sheets (No. 24).....	3.80c.
Galv. sheets (No. 24).....	4.35c.
Blue ann'd sheets (No. 10).....	3.35c.
Spikes ( $\frac{1}{4}$ in. and larger).....	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
Per Cent Off List	
Machine bolts.....	60 and 10
Carriage bolts.....	60 and 10
Coach or lag screws.....	60 and 10
Hot-pressed nuts, sq., tap. or blank,	60 and 10
Hot-pressed nuts, hex., tap. or blank,	60 and 10
No. 8 black ann'd wire, per 100 lb.	\$3.45
Com. wire nails, base per keg.	\$2.30 to 2.55
Cement c'd nails, base per keg	2.30 to 2.55

# CLEVELAND

## First Quarter Contracts for Bars, Plates and Shapes Made at 1.60c.

CLEVELAND, Dec. 16.—Some of the mills during the week covered many of their customers with contracts for bars, plates and shapes at 1.60c., Pittsburgh. Some consumers have placed contracts at 1.65c. The market is in better shape from a price standpoint than during a portion of the current quarter when there was shading from the 1.60c. price. The competitive situation has been intensified by the reaching out of a Chicago district mill into this territory with efforts to take first quarter business in bars, plates and shapes at 1.60c., Pittsburgh. Specifications are rather light and, as recent mill prices on most products will remain in effect for the coming quarter, consumers have little incentive to order steel against contracts that expire this month.

While requirements of buyers will be light the remainder of the month, a few specifications are being issued for steel to be delivered in January and these are expected to increase toward the end of the month. There will be rather general suspension of mill operations during the two holiday weeks. There is increased activity in pig iron sales, but shipments are light. Local mills are maintaining recent operations of 47 per cent of ingot capacity.

### Sheets

While some additional first quarter contracts have been placed, many consumers are not showing interest in contracts. A few orders came from the motor car industry in Detroit during the week, but none was for round tonnage. One mill has announced that it will not make concessions to jobbers on first quarter business and that has brought out same tonnage against last quarter contracts. Black sheets appear to be well maintained at 2.35c., Pittsburgh. On galvanized sheets 2.90c. is rather common in spite of efforts of some mills to hold to 3c. An order for 500 tons for the Higbee Co. Building went to a Valley mill. Auto body sheets are firm at 3.30c.

### Pig Iron

Sales increased the past week, during which Cleveland interests sold 22,000 tons of foundry and malleable iron. Contracts for the entire first half were placed in a few cases. The Westinghouse Electric & Mfg. Co. divided about 1900 tons for its Cleveland plant between local furnaces. A Dayton consumer purchased 1000 tons from a Lake furnace. Automobile manufacturers are following a cautious policy and some contracts placed by that industry were only for part of the first quarter. Some business in Ohio went at \$16 and other or-

ders were placed at \$16.50, Lake furnace. Locally, \$17.50 is being maintained. In Michigan, the spread of \$17.50 to \$18 continues. While the market is fairly firm in most sections, some business is being taken for shipment to points that necessitate the absorption of high freight rates. With a \$11 Birmingham price, Southern iron is more of a competitive factor in this territory than recently, but orders for the Southern grade appear to be confined to the stove industry.

### Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25.....	\$17.50
S'th'n fdy., sil. 1.75 to 2.25.....	17.01
Malleable .....	17.50
Ohio silvery, 8 per cent.....	25.00
Stand. low phos., Valley.....	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; \$3 from Jackson, Ohio; \$6.01 from Birmingham.

### Bars, Plates and Shapes

The 1.65c. Cleveland base for steel bars is still being quoted and, while this price is well established for Cleveland delivery, it remains to be developed whether the price will hold for outside shipment in view of the present 1.60c. Pittsburgh base. Consumers outside of Cleveland have 1.60c. Cleveland contracts for the current quarter and a number have closed first quarter contracts at a \$1 a ton advance. Specifications for bars show some gain, mostly from industries outside of the automotive field. Structural awards in the building field in this territory are light and this is reflected in a falling off in orders for shapes. Some fair-sized business in plates has been placed for repair of Lake boats, although the market generally is dull.

### Semi-Finished Steel

While there is talk of a \$30 price on billets, sheet bars and slabs for the first quarter, or a reduction of \$1 a ton, the local producer announces that it has not yet named a price for that delivery.

### Cold-Finished Steel Bars

Prices are unchanged at 2c. to 2.10c.,

### Warehouse Prices, f.o.b. Cleveland

Base per Lb.	
Plates and struc. shapes.....	2.95c.
Soft steel bars.....	2.85c.
Reinforc. steel bars.....	2.25c. to 2.50c.
Cold-fin. rounds and hex.....	3.40c.
Cold-fin. flats and sq.....	3.90c.
Hoops and bands, No. 12 to 14 in., inclusive .....	3.10c.
Hoops and bands, No. 13 and lighter .....	3.65c.
Cold-finished strip.....	*5.95c.
Black sheets (No. 24).....	3.60c.
Galvanized sheets (No. 24).....	4.35c.
Blue ann'd sheets (No. 10).....	3.10c.
No. 9 ann'd wire, per 100 lb.....	\$2.35
No. 9 galv. wire, per 100 lb.....	2.80
Com. wire nails, base per keg.....	2.25

\*Net base, including boxing and cutting to length.

Cleveland, and it is expected that this range will continue through the first quarter.

### Wire Products

Nails appear to be firm at \$1.90 a keg to jobbers, but sales are very light. Manufacturers' wire ranges from 2.20c. to 2.30c., Cleveland.

### Strip Steel

While orders from a few stamping plants doing Chevrolet work have stimulated hot-rolled strip to some extent, the demand as a whole continues light. Some first quarter contracts have been placed and a few buyers have sought unsuccessfully to place contracts for the first half. Although there is some pressure for concessions, prices in this territory are holding to 1.55c., Pittsburgh, for wide strip and 1.65c. for narrow. Cold-rolled strip continues very dull. This is steady at 2.25c., Cleveland, with \$2 a ton higher for small lots.

### Bolts, Nuts and Rivets

Present prices of \$2.75 a 100 lb., Cleveland and Pittsburgh, and \$2.85, Chicago, for large rivets and 70, 10 and 5 per cent off for small rivets have been reaffirmed for the first quarter. Rivet orders are light. Buyers of bolts and nuts have not shown much interest in contracts since the reestablishment of present discounts for the first quarter was announced.

### Old Material

The market is virtually at a standstill. Mills are taking almost no scrap from dealers and the latter have their yards well filled and are buying very little scrap for yard stocks and that at price concessions. Mills still have large stocks. A Cleveland mill received another cargo of scrap from Detroit during the week. Prices are largely nominal.

### Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel.....	\$10.25 to \$10.75
No. 2 heavy melting steel.....	9.75 to 10.25
Compressed sheet steel.....	9.75 to 10.00
Light' bundled sheet stampings .....	8.50 to 9.00
Drop forge flashings .....	9.75 to 10.00
Machine shop turnings.....	4.75 to 5.25
Short shovelling turnings.....	7.75 to 8.00
No. 1 railroad wrought.....	9.50 to 10.00
No. 2 railroad wrought.....	10.00 to 10.50
No. 1 busheling .....	9.50 to 10.00
Pipes and flues.....	6.50 to 7.00
Steel axle turnings.....	9.50 to 10.00
Acid Open-Hearth Grades:	
Low phos., billet bloom and slab crops .....	16.50 to 17.00
Blast Furnace Grades:	
Cast iron borings.....	7.00 to 7.25
Mixed borings and short turnings .....	7.00 to 7.25
No. 2 busheling .....	6.50 to 6.75
Cupola Grades:	
No. 1 cast .....	12.00 to 12.50
Railroad grate bars.....	10.00 to 10.50
Stove plate .....	10.50 to 11.00
Rails under 3 ft.....	16.00 to 16.50
Miscellaneous:	
Rails for rolling.....	16.25 to 16.50
Railroad malleable.....	12.50 to 13.00



# NEW YORK

## Steel Contracting for First Quarter Proceeding —Pig Iron Sales 7500 Tons

NEW YORK, Dec. 16.—Pig iron sales, at 7500 tons, compare with 11,000 tons in the previous week and 10,500 tons two weeks ago. While transactions of the past week were in the main individually small, a number of new sizable inquiries have appeared. The Thatcher Co., Newark, N. J., is in the market for 3000 tons for the first quarter, and the Worthington Pump & Machinery Corp., New York, is asking for prices on 2600 tons for the same delivery—1700 tons for Buffalo, 700 tons for Harrison, N. J., and 200 tons for its Holyoke, Mass., plant. One melter, who has just bought 200 tons for December shipment, will also purchase 550 tons for first quarter. Another foundry wants 700 tons for the coming quarter. The A. P. Smith Mfg. Co., East Orange, N. J., has closed for 400 tons for second quarter, and an inquiry for 1500 tons for shipment throughout 1931 is still pending.

The amount of forward buying done in the past month or two runs into considerable tonnage and is testimony to the belief of the trade that prices, subject to minor variations, are scraping bottom. The American Radiator & Standard Sanitary Corp., which closed for 50,000 tons for various plants early in November, has since bought 25,000 tons additional. Other radiator and boiler manufacturers also have bought generously.

Price competition has become sharper in nearby New Jersey, with Alabama iron selling more commonly at \$10.50, Birmingham, and in some cases at delivered quotations that figure back to \$10, Birmingham. Southern prices are being met by some of the Northern producers, notably the New England furnace.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75	
to 2.25	\$20.41 to \$20.91
*Buff. No. 2, del'd east.	
N. J.	18.28 to 19.28
East. Pa. No. 2 fdy., sil.	
1.75 to 2.25	17.39 to 18.39
East. Pa. No. 2X fdy., sil.	
2.25 to 2.75	17.89 to 18.89

Freight rates: \$4.91 from Buffalo, \$1.39 to \$2.52 from eastern Pennsylvania.

\*Prices delivered to New Jersey cities having rate of \$3.28 a ton from Buffalo.

### Finished Steel

Contracting for first quarter has absorbed the attention of buyers and sellers of steel in the past week. Business for current shipment is almost negligible, but some orders are being entered for delivery in January. It cannot be said, however, that there is any great urge to buy ahead, even on the usual form of optional contract. A possible exception is in sheets, users of which, perhaps anticipating a rise in prices in the first quarter, are fairly unanimous in seeking protection. Some large buy-

ers who did not make any contracts for the present quarter are now willing to make their usual contract reservations.

Most of the mills seem to be willing to make contracts at the minimum prices recently in effect. A good many buyers have escaped the necessity of paying the \$1 a ton advance on plates, shapes and bars, announced early in December, and have contracted for their first quarter needs at 1.60c., Pittsburgh, or the equivalent at Eastern mills. It appears that 1.65c., Pittsburgh, or 1.75c., Eastern mills, will be paid mostly by the smaller buyers or those who delay in closing quarterly arrangements with the mills. Sheet contracts have been made at 2.35c., Pittsburgh, for black, 2.05c. for No. 13 gage blue annealed and 1.90c. for No. 10, while galvanized sheets have generally settled to 2.90c., but the market is firmer at that price than it was at 3c., the figure which some mills announced for the first quarter. The 2.90c. price was reserved for large jobbers, but it has been quite generally extended to large consumers as well.

While the situation points to some improvement in steel operations and shipments before Jan. 15, there seems to be no expectation that the upward trend, if it comes, will be more than gradual.

### Warehouse Prices, f.o.b. New York

Base per Lb.	
Plates and structural shapes.....	3.10c.
Soft steel bars, small shapes.....	3.10c.
Iron bars.....	3.24c.
Iron bars, Swed. charcoal.....	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons.....	3.40c.
Flats and squares.....	3.90c.
Cold-roll. strip, soft and quarter	
hard.....	4.95c.
Hoops.....	3.75c.
Bands.....	3.40c.
Blue ann'l'd sheets (No. 10).....	3.25c. to 3.40c.
Black sheets (No. 24*).....	3.65c. to 3.75c.
Galvanized sheets (No. 24*).....	4.25c.
Long terme sheets (No. 24).....	5.80c.
Standard tool steel.....	12.00c.
Wire, black annealed.....	4.50c.
Wire, galv. annealed.....	5.15c.
Tire steel, ½ x ½ in. and larger.....	3.40c.
Smooth finish, 1 to 2½ x ¼ in.	
and larger.....	3.75c.
Open-hearth spring steel, bases.....	4.50c. to 7.00c.

\*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

Per Cent Off List	
Machine bolts, cut thread:	
¾ x 6 in. and smaller.....	65
1 x 30 in. and smaller.....	65
Carriage bolts, cut thread:	
¾ x 6 in. and smaller.....	65
¾ x 20 in. and smaller.....	65
Boiler Tubes:	
Lap welded, 2-in.....	\$19.00
Seamless steel, 2-in.....	20.25
Charcoal iron, 2-in.....	26.25
Charcoal iron, 4-in.....	67.00

### Warehouse Business

While the first half of December compared favorably with the first two weeks of November, most jobbers report a decided decline in buying with the year end. Prices are generally unchanged and minor concessions are not unusual on most products, when a fair-sized order is offered.

### Reinforcing Bars

Indicative of the importance of public works as a market stimulant, all of the awards and inquiries reported during the week were for public undertakings. A Brooklyn subway section, on which general contract bids will be taken today, calls for 1400 tons and two sections in Queens to come up for figures Dec. 22 will require 980 tons.

For mill shipment, distributors of concrete bars quote 1.70c. a lb., Pittsburgh, on building and paving work, and 1.80c. on subway work (rail steel offered at \$4 a ton less); for delivery from local stock, 2.35c. a lb., New York, up to 3.05c. a lb. for lots of less than 2 tons.

### Cast Iron Pipe

The large public utilities are slow to issue their usual inquiries for pressure pipe to be delivered through the winter or in the spring. The Federal Water Service Co., New York, is inquiring for about 6000 tons of water pipe and the American Construction & Securities Co. is asking for quotations on an indefinite tonnage. Prices are unchanged at \$35 to \$36 a ton, f.o.b. Northern foundry.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, \$37.90 to \$38.90; 4-in. and 5-in., \$40.90 to \$41.90; 3-in., \$47.90 to \$48.90. Class A and gas pipe, \$3 extra.

### Coke

Foundry coke specifications continue to decline, one important distributor reporting a 10 per cent recession from the reduced volume of the previous week. The fall in coke shipments was not unexpected, since many foundries will close for inventory taking next week and others will do so in the first 10 days or two weeks of January. Furnace coke prices range from \$2.50 to \$2.60 a net ton, Connellsville, and foundry coke quotations follow:

Special brands of beehive foundry coke, \$4.70 to \$4.85 a net ton, ovens, or \$8.41 to \$8.56 delivered to northern New Jersey, Jersey City and Newark, and \$9.29 to \$9.44 to New York and Brooklyn; by-product foundry coke, \$9 to \$9.40, Newark or Jersey City; \$10.06, New York or Brooklyn.

### Old Material

Brokers continue to pay \$11 a ton, delivered eastern Pennsylvania, for

(Concluded on page 1896)

# PHILADELPHIA

## Steel Prices Are Firmer— Gas Holders Projected

PHILADELPHIA, Dec. 16.—The volume of new steel business has not increased appreciably, but there is slightly more inquiry for future delivery and sentiment is better. Operations in the rolling departments of eastern Pennsylvania mills continue at about 40 per cent of rated capacity. Prices of bars, plates and shapes are firm at 1.60c. to 1.65c., Pittsburgh, the lower price applying on large lots and on contracts with large consumers. Sheet quotations are steady. Much of the improvement in sentiment is evidently based on freer inquiry by consumers for their estimated requirements in the first quarter, and growing confidence of sellers that prices have reached some measure of stability.

Locomotives to be bought by the railroads represent a substantial steel tonnage. To the total already under inquiry, the Canadian National Railways have added 20 more. Two gas holders are to be built by the Philadelphia Gas Co., one at Reading, Pa., requiring about 2000 tons of steel, and a slightly larger one at Lardner's Point.

### Steel Bars

A few consumers have covered their first quarter requirements at 1.60c., Pittsburgh, or 1.89c., delivered Philadelphia, and on small lots of bars for current delivery, 1.65c., Pittsburgh, is being quoted. Although mills are holding reinforcing bars at 1.65c., Pittsburgh, competition is keen, and, with eastern Pennsylvania rerolling mills willing to quote on this basis direct to users, distributors are continuing to quote 1.65c. to 1.70c., Pittsburgh, or 1.94c. to 1.99c., Philadelphia, for billet steel bars. Rail steel bars are inactive and continue at about 1.50c., Franklin, Pa., or 1.79c., delivered Philadelphia.

### Pig Iron

Foundry iron quotations continue at \$17 to \$17.50 a ton, eastern Pennsylvania furnace, the lower price being obtainable on desirable tonnages or when competition is encountered from Southern iron. Birmingham furnaces have adopted a firmer attitude on foundry iron sales in eastern Pennsylvania and are not inclined to shade \$11 a ton. This is attributed by eastern Pennsylvania sellers to the fact that by the end of this month the Birmingham district does not expect to have more than five furnaces in blast. About 8000 tons of Indian pig iron which arrived at this port during the past month included some basic and a substantial tonnage of foundry grade for a cast iron pipe maker. A distress cargo of about 2000 tons of low phosphorus British

iron recently disposed of in this district at about \$20.25 a ton, delivered, is understood to have been divided between two steel mills. Inquiry for first quarter delivery of foundry iron is small at present, but, with only a small part of future requirements covered, sellers expect a moderate demand after the turn of the year.

#### Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	\$17.76 to \$18.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	18.26 to 19.26
East. Pa. No. 1X	18.76 to 19.76
Basic (del'd east. Pa.)	17.75 to 18.25
Malleable	19.00 to 20.00
Stand. low phos. (f.o.b. east. Pa. furnace)	23.00 to 24.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 23.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to \$1.64 from eastern Pennsylvania furnaces; \$4.54 from Virginia furnaces.

### Shapes

Shipments are still being made on low-priced commitments for the present quarter, but on new business 1.70c., f.o.b. nearest mill to consumer, or 1.76c., Philadelphia, is the minimum, with 1.75c., mill, or 1.81c., Philadelphia, quoted on small lots. Despite a firmer shape market, fabricators do not appear to be quoting higher prices on fabricated structural steel projects.

### Plates

Mill operations are at 40 per cent of capacity and in some cases lower, except for the leading independent. While the larger contract buyers are being protected for the first quarter at 1.70c., Coatesville, or 1.80½c. a lb., delivered Philadelphia, mills are attempting to get 1.75c., Coatesville, for small lots.

### Sheets

Radio manufacturers in this district have further curtailed output, with the exception of the Philadelphia

### Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.50c.
Structural shapes	2.50c.
Soft steel bars, small shapes, iron bars (except bands)	2.60c.
Reinforc. steel bars, sq. twisted and deform.	2.50c. to 2.60c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to ¼-in. incl.	2.90c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.60c.
†Galvanized sheets (No. 24)	4.15c.
Light plates, blue annealed (No. 10)	3.05c.
Blue ann'd sheets (No. 13)	3.20c.
Diam. pat. floor plates, ¼-in.	5.20c.
Swedish iron bars	6.60c.

\*For 50 bundles or more; 10 to 40 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.  
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Storage Battery Co., which reduced its production schedule as the season neared an end and found it necessary to step up slightly to meet continued demand. Automobile body builders and accessory manufacturers are increasingly active as they receive releases on their contracts with automobile builders. Sheet prices are unchanged at 2.35c., Pittsburgh, or 2.64c., Philadelphia, for black sheets and 3c., Pittsburgh, or 3.29c., Philadelphia, for galvanized. Jobbers and large users of galvanized sheets are usually granted \$2 concessions to 2.90c., Pittsburgh, or 3.19c., Philadelphia. Blue annealed sheets are unchanged at 2.05c., Pittsburgh, or 2.34c., Philadelphia, for No. 13 gage, and blue annealed plates, No. 10 gage, are 1.90c., Pittsburgh, or 2.19c., Philadelphia.

### Imports

In the week ended Dec. 13 arrivals at this port consisted of 648 tons of pig iron from British India, 50 tons of spiegeleisen from the United Kingdom and 28 tons of steel bars from Germany.

### Old Material

All grades of scrap are inactive and prices are generally unchanged. A Bethlehem, Pa., mill has recently bought about 1000 tons of No. 1 heavy melting steel from railroads at \$10.25 to \$10.50 a ton, delivered. A Coatesville, Pa., consumer is receiving delivery by barge to Wilmington, Del., of No. 1 steel from Galveston, Tex. This is material that under normal business conditions is shipped to Japan or Italy.

#### Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	\$11.00 to \$11.50
No. 2 heavy melting steel	9.50
Heavy melting steel (yard)	9.00
No. 1 railroad wrought	13.00 to 14.00
Bundled sheets (for steel works)	9.00
Hydraulic compressed, new	10.00 to 10.50
Hydraulic compressed, old	9.00 to 9.50
Machine shop turnings (for steel works)	6.50 to 7.50
Heavy axle turnings (or equiv.)	10.50 to 11.00
Cast borings (for steel works and roll. mill)	7.50
Heavy breakable cast (for steel works)	11.00 to 11.50
Railroad grate bars	9.00
Stove plate (for steel works)	9.00
No. 1 low phos., hvy., 0.04% and under	17.00 to 18.00
Couplers and knuckles	16.50 to 17.50
Rolled steel wheels	15.50 to 16.00
No. 1 blast f'nace scrap	6.50 to 7.00
Wrot. iron and soft steel pipes and tubes (new specific.)	11.50 to 12.00
Shafting	18.00
Steel axles	20.50 to 21.00
No. 1 forge fire	11.00
Cast iron carwheels	14.00 to 14.50
No. 1 cast	12.00 to 12.50
Cast borings (for chem. plant)	14.00 to 14.50
Steel rails for rolling	13.50 to 14.00



## BOSTON

### Further Shrinkage In Pig Iron Sales— Scrap Business Dull

**B**OSTON, Dec. 16.—There was a further shrinkage in pig iron sales the past week, bookings totaling a scant 1200 tons, practically all of which was taken by the Mystic Iron Works. One of the largest sales was 250 tons of No. 1X iron to the Westinghouse Electric & Mfg. Co., Springfield, Mass., for fairly prompt shipment. A southern New England melter will probably close on 1400 tons of second, third and fourth quarter iron this week, and a Vermont foundry on 100 tons of malleable, but otherwise there is little or no business in sight. Prices are still unsettled and in the buyer's favor. No. 2 plain, No. 2X and No. 1X grades were offered the past week at the equivalent of \$15 a ton, Buffalo, or within a very few cents of it.

*Foundry iron prices per gross ton deliv'd to most New England points:*

*Buffalo, sil. 1.75 to 2.25..	\$19.91 to \$20.91
*Buffalo, sil. 2.25 to 2.75..	19.91 to 20.91
*Ala., sil. 1.75 to 2.25.....	21.11
*Ala., sil. 2.25 to 2.75.....	21.61
†Ala., sil. 1.75 to 2.25.....	17.25
†Ala., sil. 2.25 to 2.75.....	17.75

Freight rates: \$4.91 all rail from Buffalo; \$9.61 all rail from Alabama and \$5.75 rail and water from Alabama to New England seaboard.

\*All rail rate.

†Rail and water rate.

#### Cast Iron Pipe

Milford, Mass., has placed an order with the Warren Foundry & Pipe Co. for 3½ miles of 6 and 8-in. pipe, mostly 8 in., which the company will manufacture at its new Everett, Mass., foundry. No other awards of importance were made the past week. Some of the large utility companies are sounding out the market and will probably place round tonnages of gas pipe early next month. The market for Class B pipe is \$36 a ton, foundry, on 6-in. and larger sizes. A \$3

differential is asked on Class A and gas pipe.

#### Reinforcing Steel

A 100-ton lot for a Fall River, Mass., post office and two 35-ton lots were the most important transactions the past week. Billet steel bar sellers are now adhering closely to 3c. a lb., base, from stock, but the market for 6 to 99-ton lots is weaker at 2.40c., and for 100-ton lots and larger at 2.15c.

#### Old Material

The market is considered a little firmer owing to the fact that certain brokers have raised their offers 10c. a ton on heavy melting steel, scrap rails, long bundled skeleton, forge scrap and forge flashings. There is not enough business, however, to really establish market values, and the trade believes conditions will not change during the remaining two weeks of 1930. Opinion as to No. 1 machinery

cast values is divided, about half the trade holding to \$11 to \$11.50 a ton, delivered, and the other half to \$12 to \$12.50, but no sales were reported the past week. Breakable cast moved in a small way at \$5.60 to \$6.10 a ton on cars, shipping point, and No. 2 cast at \$5.50 to \$6.

*Buying prices per gross ton, f.o.b. Boston rate shipping points:*

No. 1 heavy melting steel.	\$6.60 to \$7.10
Scrap T rails.....	6.60 to 7.10
Scrap girder rails.....	5.60 to 6.10
No. 1 railroad wrought...	7.50 to 7.60
Machine shop turnings...	2.00 to 2.60
Cast iron borings (steel works and rolling mill)	2.00 to 2.60
Bundled skeleton, long....	5.75 to 6.10
Forge flashings .....	5.75 to 6.10
Blast furnace borings and turnings .....	2.00 to 2.10
Forge scrap .....	5.60 to 6.10
Shafting .....	12.50 to 13.50
Steel car axles.....	14.00 to 15.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	6.00 to 6.50
Rails for rolling.....	8.50 to 9.00
Cast iron borings, chemical	9.00 to 9.50
No. 2 cast.....	5.50 to 6.00

*Prices per gross ton deliv'd consumers' yards:*

Textile cast .....	\$11.00 to \$11.50
No. 1 machinery cast.....	11.50 to 12.50
Stove plate .....	8.00 to 8.50
Railroad malleable .....	13.00 to 13.50

## BIRMINGHAM Steel Buying Slightly Improved— Pig Iron Dull

**B**IRMINGHAM, Dec. 16.—Although Alabama producers of pig iron have not formally opened their books for first quarter, a few melters have ordered iron to be delivered after Jan. 1 at the \$14 base price which has applied on sales for shipments in the district during the current quarter. There is no pressure among consumers to cover their iron requirements on contract, but furnaces may announce the opening of books within a few days. Movement of iron is light.

The No. 2 furnace of the Republic Steel Corp., which has been making foundry iron, will be blown out this week for relining and other repairs. This will leave eight active furnaces, seven on foundry iron and one on basic.

*Prices per gross ton, f.o.b. Birmingham dist. furnaces:*

No. 2 fdy., 1.75 to 2.25 sil.....	\$14.00
No. 1 fdy., 2.25 to 2.75 sil.....	14.50
Basic .....	14.00

#### Finished Steel

Bookings for the week were reported to be better than for any week since October. Sheets are said to have led in this gain, with plates and structural shapes running a close second. No rail buying is reported. Car building shops are taking very little steel, one of the larger ones being practically idle. No reason is given for the little spurt in buying last week, but it is thought that it may have been influenced some by the recent developments in the price situation. Mills here have not followed other districts in raising prices on bars, plates and shapes, and these continue to be quoted at 1.75c. to 1.80c.

The structural steel market is showing improvement after two of the dullest weeks of the year. Small orders are picking up a little. The Ingalls Iron Works Co. has booked 1600 tons for two new underpasses at Birmingham. The Virginia Bridge & Iron Co. plant here has received contract for 250 tons for a new crane for the Washington State hydroelectric plant. Contracts are pending on approximately 4000 tons for a new Louisiana State capitol building at Baton Rouge, for which general contract has been let to the George A. Fuller Co., Washington. This project will also require about 1000 tons of reinforcing bars.

#### Cast Iron Pipe

Due largely to efforts of municipalities to rush construction work for relief of the unemployment situation, demand for cast iron pipe has increased rapidly in the past 10 days. Last week was one of the best weeks of the year. Large orders were more numerous and there was a marked increase in small orders. Nearly all small orders were marked rush. Several jobs have been tied up owing to the closing of large financial institutions in the South. New orders of the American Cast Iron Pipe Co. include 800 tons of 17 to 24-in. pipe for Detroit, 550 tons for Hyattsville, Md., 200 tons for Yorba Linda, Cal., 300 tons for San Francisco, 70 tons for Douglas, Ariz., and 60 tons for Alhambra, Cal. The National Cast Iron Pipe Co. has booked 2000 tons for Marrero, La., and 250 tons for San Francisco. The United States Pipe & Foundry Co. booked 900 tons for Du-

#### Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates .....	3.36½c.
Structural shapes—	
Angles and beams.....	3.36½c.
Tees .....	3.36½c.
Zees .....	3.36½c.
Soft steel bars, small shapes....	3.26½c.
Reinforcing bars.....	3.11½c. to 3.26½c.
Iron bars—	
Refined .....	3.26½c.
Best refined .....	4.60c.
Norway rounds .....	6.60c.
Norway squares and flats.....	7.10c.
Spring steel—	
Open-hearth .....	5.00c. to 10.00c.
Crucible .....	12.00c.
Tire steel .....	4.50c. to 4.75c.
Bands .....	4.015c. to 5.00c.
Hoop steel .....	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex.....	3.50c. to 5.50c.
Squares and flats.....	4.00c. to 6.00c.
Toe calk steel .....	6.00c.
Rivets, structural or boiler.....	4.80c.
Per Cent Off List	
Machine bolts.....	.60 and 5
Carriage bolts .....	.60 and 5
Lag screws .....	.60 and 5
Hot-pressed nuts .....	.60 and 5
Cold-punched nuts .....	.60 and 5
Stove bolts .....	.70 and 10

luth, Minn., and 250 tons for San Francisco. The United Gas Improvement Co. has placed orders here totaling about 5000 tons, which was divided among the four leading producers. Plants here are expected to share in the 11,000-ton project pending at Detroit; also projects at Fort Wayne, Ind., and Phoenix, Ariz., which are to require around 1000 tons each. Mobile, Ala., will open bids Dec. 16 on several hundred tons of larger sizes of pipe, and Seattle, Wash., will open bids on the same date on 500 tons. Tacoma, Wash., is to open bids Dec. 18 on 500 tons and Bremerton, Wash., is to award 300 tons on Dec. 17. The project at Lawton, Okla., for which bids are to be opened Dec. 19, will require around 2000 tons, mostly in large sizes. Dec. 23 has been set as date for opening bids on 600 tons at Milwaukee. Portland, Ore., is inquiring on 2000 tons or more. The project at Spartanburg, S. C., for which bids are to be opened Dec. 16 will take around 175 tons. Bogalusa, La., will open bids Jan. 6 for 4300 ft. of 12 and 16-in. pipe. Shading of prices below quoted figures of \$37 to \$38, Birmingham, is reported less frequent than 10 days ago.

### Coke

The Woodward Iron Co. has taken off 31 ovens and is now operating 130 of its 230 ovens. For the district as a whole, there are now 903 active ovens of 1390, leaving 487 on the idle list.

### Old Material

Sales are negligible. Consumers have not begun inquiring for scrap for January delivery. Only a little scrap is moved on old contracts. Dealers are continuing their recent quotations through the present inactive market.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:

Heavy melting steel.....	\$10.00
Scrap steel rails.....	10.50
Short shoveling turnings.....	9.00
Cast iron borings.....	9.00
Stove plate.....	9.00
Steel axles.....	19.00
Iron axles.....	18.00
No. 1 railroad wrought.....	10.00
Rails for rolling.....	11.50 to 12.00
No. 1 cast.....	11.00 to 11.25
Tramcar wheels.....	11.00 to 11.25
Cast iron borings, chem.....	13.50
Cast iron carwheels.....	11.00

Frank L. Morse, president and treasurer, Morse Chain Co., Ithaca, N. Y., and head of other Ithaca enterprises, was the principal speaker at a banquet of Morse executives, including superintendents, foremen and office men, Tuesday evening, Dec. 9, at Ithaca. Mr. Morse said that he expected a general upturn in business in the late spring.

Republic Steel Corp., at a meeting of the board of directors Dec. 16, passed the quarterly dividend on preferred stock due Jan. 1.

## ST. LOUIS

ST. LOUIS, Dec. 16.—Further price reductions were reported in Southern pig iron during the week, some sales having been made at the extremely low price of \$10, f.o.b. Birmingham. An East Side melter is said to have bought 1500 tons at \$10.25. However, the reductions have not stimulated any great amount of buying. The St. Louis Gas & Coke Corp. reports its price being held firmly at \$17.50, f.o.b. Granite City. While buying continues light, specifications for shipment against contracts are said to be heavy in order to clean up commitments. However, some melters are asking for further time to complete contracts in an effort to hold down inventories. Action by large basic consumers on the East Side is expected some time this week.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill....	\$17.50
Malleable, f.o.b. Granite City.....	17.50
N'th'n No. 2 fdy., deliv'd St. Louis.....	19.66
Southern No. 2 fdy., deliv'd.....	\$14.42 to 14.92
Northern malleable, deliv'd.....	19.66
Northern basic, deliv'd....	19.66

Freight rates: 75c. (average) Granite City to St. Louis; \$2.16 from Chicago; \$4.42 from Birmingham.

### Finished Steel

The Wabash Railway has purchased 10,500 tons of 110-lb. rails for April, May and June, 1931, deliveries, allocated as follows: Illinois Steel Co., 5500 tons; Inland Steel Co., 4000 tons, and Bethlehem Steel Co., 1000 tons, which companies also will roll the angle and splice bars required. This is the only line centering here to inquire for rails for 1931 delivery. The demand for plates, shapes and bars is light because of inventory taking, but so far there has been no resistance to the recent price advance, consumers being eager for price stabilization. The only structural steel

### Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
Cold-fin. rounds, shafting, screw stock.....	3.60c.
Black sheets (No. 24).....	4.25c.
Galv. sheets (No. 24).....	4.60c.
Blue ann'l'd sheets (No. 10).....	3.45c.
Black corrug. sheets (No. 24).....	4.10c.
Galv. corrug. sheets.....	4.70c.
Structural rivets.....	4.15c.
Boiler rivets.....	4.15c.

### Per Cent Off List

Tank rivets, 7/8-in. and smaller, 100 lb. or more.....	65
Less than 100 lb.....	60
Machine bolts.....	60
Carriage bolts.....	60
Lag screws.....	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50

## Southern Pig Iron Sold as Low as \$10, Birmingham

award of the week, 250 tons for a reformatory at Algire, Mo., went to the LaSalle Iron Works.

### Old Material

Dealers have been laying down scrap in their yards for several weeks, one large factor here stating that its stocks are the largest in five years. Business with consumers is extremely dull, and it is not believed there will be any buying movement until after Jan. 1. An East Side mill is said to have bought specialties from one dealer at prices which others would not meet. Prices are unchanged, except for miscellaneous standard-section rails, which are 50c. higher, because of scarcity.

Railroad lists: Louisville & Nashville, 5582 tons; Missouri-Kansas-Texas, 3565 tons; Chicago, Rock Island & Pacific, 2715 tons; Chesapeake & Ohio, 2669 tons; International Great Northern, 1830 tons; Wabash, 1492 tons; Chicago & Alton, 1440 tons; Chicago, Milwaukee, St. Paul & Pacific, 700 tons; Ann Arbor, 700 tons; St. Louis-San Francisco, 24 carloads; Nashville, Chattanooga & St. Louis, 7 carloads; Pullman Co., St. Louis, 5 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel.....	\$10.25 to \$10.75
No. 1 heavy melting or shoveling steel.....	9.75 to 10.25
No. 2 heavy melting or shoveling steel.....	9.00 to 9.50
No. 1 locomotive tires.....	11.00 to 11.50
Misc. stand.-sec. rails including frogs, switches and guards, cut apart....	10.75 to 11.25
Railroad springs.....	13.00 to 13.50
Bundled sheets.....	6.50 to 7.00
No. 2 railroad wrought....	9.75 to 10.25
No. 1 busheling.....	7.00 to 7.50
Cast iron borings and shoveling turnings.....	6.00 to 6.50
Iron rails.....	9.50 to 10.00
Rails for rolling.....	11.50 to 12.00
Machine shop turnings....	3.50 to 4.00
Heavy turnings.....	8.00 to 8.50
Steel car axles.....	14.00 to 15.00
Iron car axles.....	20.50 to 21.00
Wrot. iron bars and trans. 12.50 to 13.00	
No. 1 railroad wrought....	7.50 to 8.00
Steel rails, less than 3 ft..	13.00 to 13.50
Steel angle bars.....	10.00 to 10.50
Cast iron carwheels.....	11.00 to 11.50
No. 1 machinery cast....	10.50 to 11.00
Railroad malleable.....	10.00 to 10.50
No. 1 railroad cast.....	10.00 to 10.50
Stove plate.....	8.50 to 9.00
Relay. rails, 60 lb. and under.....	16.00 to 16.50
Relay. rails, 70 lb. and over.....	20.00 to 21.00
Agricult. malleable.....	10.00 to 10.50

Announcement has been made by the M. P. Mollar Motor Car Co., Hagerstown, Md., that for the second time within the past few months it has received an order for 500 taxicabs from the Paramount Taxicab Co., New York. It was stated that the second order will assure continuous employment until next spring of the several hundred men engaged by the company when the first order for 500 taxicabs was received from the New York concern.



## PACIFIC COAST Steel Prices Firmer—No Improvement Develops in Demand

SAN FRANCISCO, Dec. 13.—(By Air Mail)—Pacific Coast prices on plates, shapes and bars have not been advanced since the \$1 a ton increase announced in the Eastern markets. However, quotations are firmer. Little or no improvement in demand is noted.

### Bars

The outstanding reinforced steel bar award, involving 350 tons for the Paramount Theater, Oakland, was secured by the Soule Steel Co. The only other award of importance called for 100 tons for an apartment on North Menlo Avenue, Los Angeles. Among the new inquiries is 200 tons for the Valley Bank Building, Phoenix, Ariz. Bids have been opened on 400 tons for a bridge near Coquille, Ore. Out-of-stock prices in the Los Angeles and San Francisco districts continue firm at 2.50c., base, for carload lots.

### Plates

The Western Pipe & Steel Co. will fabricate 3000 tons of plates for a 38 and 51-in. welded steel pipe line for Los Angeles. Bids have been opened on 243 tons for two tanks for the United States Bureau of Reclamation to be installed at Boulder City, Nev. The Seattle city council has approved another pipe line project which will cost upward of \$50,000. Prices of plates range from 2.05c. to 2.15c., c.i.f.

### Shapes

The Consolidated Steel Corp. has booked 750 tons for a theater on Wilshire Boulevard, Los Angeles, and the Minneapolis-Moline Power & Implement Co. took 100 tons for a school addition in Pasadena. A warehouse for the Puget Sound Navy Yard, Bremerton, Wash., involving 300 tons, will be erected by the Newport Construction & Engineering Co. New inquiries include 1300 tons for an auditorium in Pasadena, bids on which will be opened Dec. 22, and 365 tons for a bridge over the Russian River near Santa Rosa, bids on which will be opened Dec. 23. Shapes are unchanged at 2.15c. to 2.25c., c.i.f.

### Cast Iron Pipe

Awards included 550 tons and 200 tons of 14-in. pipe for Vancouver, B. C., placed with Evans, Coleman & Evans and Leith Murray & Co., Ltd.,

### Warehouse Prices, f.o.b. San Francisco

Base per Lb.	
Plates and struc. shapes.....	3.40c.
Soft steel bars.....	3.40c.
Black sheets (No. 24).....	4.35c.
Blue ann'd sheets (No. 10).....	3.80c.
Galv. sheets (No. 24).....	5.00c.
Struc. rivets, 1/4-in. and larger....	5.00c.
Com. wire nails, base per keg....	\$2.35
Cement c'd nails, 100 lb. keg....	3.35

respectively. Los Angeles awarded the National Cast Iron Pipe Co. 409 tons of 8-in. Class 150, the Pacific States Cast Iron Pipe Co. 1226 tons and the American Cast Iron Pipe Co. 545 tons. In addition, 958 tons of 12-in. Class 150 pipe was placed with the Utilities Equipment Co. The Grinnell Co. was low bidder on 135 tons of 2-in. pipe for Long Beach, Cal. New inquiries include 147 tons of 6 and 8-in. Class 150 pipe for Red-

### Pig iron prices per gross ton at San Francisco:

*Utah basic.....	\$22.00 to \$24.00
*Utah fdy., sil. 2.75 to 3.25.....	22.00 to 24.00
**Indian fdy., sil. 2.75 to 3.25.....	22.00 to 24.00
*Delivered San Francisco.	
**Duty paid, f.o.b. cars San Francisco.	

wood City, Cal., bids on which will be opened on Dec. 22. The Dalles, Ore., will open bids on Dec. 15 for 144 tons of 6 and 8-in. Class 150 pipe.

## CINCINNATI Southern Pig Iron Weak, Sales Light—Sheet Orders Decline

CINCINNATI, Dec. 16.—On the small sales of the past week, totaling not more than 1650 tons of all grades of pig iron, \$11, base Birmingham, is said to have been received for the Southern iron, but Alabama iron is available in good-sized lots at \$10.50. Even lower prices have been quoted in other districts. According to reports here, sales for shipment into the St. Louis district have been made at \$10 and \$10.25, Birmingham. The foundry melt in the district is very low and will be further restricted during the remainder of the month through the shutting down of plants over the holidays. Several foundries plan to shut down the last of this week and remain closed until the first of the year.

Prices per gross ton, deliv'd Cincinnati:	
Ala. fdy., sil. 1.75 to 2.25.....	\$14.19 to \$14.69
Ala. fdy., sil. 2.25 to 2.75.....	14.69 to 15.19
Tenn. fdy., sil. 1.75 to 2.25.....	14.19 to 14.69
S'th'n Ohio silvery, 8 per cent.....	24.39

Freight rates, \$1.89 from Ironton and Jackson, Ohio; \$3.69 from Birmingham.

### Finished Steel

Sheet buying has tapered in the past week, presumably due to the holiday season and the year-end inventory period. Demand, such as it is, is well diversified, and buyers are inquiring more freely. District sheet mills continue to operate at close to 50 per cent of capacity. One mill in this district may be shut down for two weeks.

### Old Material

New business in scrap is negligible. Prices are unchanged from last week.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel.....	\$10.00 to \$10.50
Scrap rails for melting.....	10.50 to 11.00
Loose sheet clippings.....	5.50 to 6.00
Bundled sheets.....	8.75 to 9.25
Cast iron borings.....	4.00 to 4.50
Machine shop turnings.....	5.00 to 5.50
No. 1 busheling.....	8.00 to 8.50
No. 2 busheling.....	4.50 to 5.00
Rails for rolling.....	11.50 to 12.00
No. 1 locomotive tires.....	11.00 to 11.50
No. 2 railroad wrought.....	9.50 to 10.00
Short rails.....	14.75 to 15.25
Cast iron carwheels.....	10.50 to 11.00
No. 1 machinery cast.....	14.00 to 14.50
No. 1 railroad cast.....	12.00 to 12.50

Burnt cast.....	6.50 to 7.00
Stove plate.....	6.50 to 7.00
Brake shoes.....	6.50 to 7.00
Agricultural malleable.....	12.00 to 12.50
Railroad malleable.....	13.00 to 13.50

Arthur G. McKee & Co., engineers and contractors, Cleveland, have received a contract from the Great Lakes Pipe Line Co., Ponca City, Okla., to construct seven pumping stations with boiler houses. The work is in connection with the new gasoline pipe line from Ponca City, Okla., to Des Moines, Iowa, where the line branches to Minneapolis and St. Paul, Minn., and Chicago. The total amount involved in building the stations with their equipment will be approximately \$650,000. Construction work on the pipe line is well under way and the building of the pumping stations will start in the near future.

Total shipments or deliveries of mechanical refrigerators in 1929 by 32 establishments engaged primarily in the manufacture of such refrigerators were valued at \$147,009,587, based on f.o.b. factory prices, according to the Bureau of the Census. This figure represents an increase of 62.9 per cent.

### Warehouse Prices, f.o.b. Cincinnati

Base per Lb.	
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
New billet reinfrc. bars.....	3.15c.
Rail steel reinfrc. bars.....	3.00c.
Hoops.....	3.90c.
Bands.....	3.35c.
Cold-fin. rounds and hex.....	3.80c.
Squares.....	4.30c.
Black sheets (No. 24).....	4.05c.
Galvanized sheets (No. 24).....	4.90c.
Blue ann'd sheets (No. 10).....	3.45c.
Structural rivets.....	4.20c.
Small rivets.....	60 per cent off list
No. 9 ann'd wire, base per 100 lb.....	\$3.00
Com. wire nails, base per keg (25 kegs or more).....	2.95
Cement c'd nails, base 100 lb. keg.....	2.95
Chain, per 100 lb.....	10.25
Net per 100 Ft.	
Lap-welded steel boiler tubes, 2-in.....	\$16.50
4-in.....	34.50
Seamless steel boiler tubes, 2-in.....	17.50
4-in.....	36.00

## BUFFALO

**B**UFFALO, Dec. 16.—A very small amount of pig iron business is being offered. Sales in the past week were not more than 3500 tons. Shipments are at the lowest volume of the year, largely because of the closing down of a good many foundries for the remainder of the year. Prices for district shipments are unchanged.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25.....	\$17.50
No. 2X fdy., sil. 2.25 to 2.75.....	18.00
No. 1 fdy., sil. 2.75 to 3.25.....	19.00
Malleable, sil. up to 2.25.....	18.00
Basic .....	17.50
Lake Superior charcoal.....	27.28

### Finished Steel

Of the total of 37 open-hearth furnaces of steel companies in the district, only nine are in operation. This is in addition to one in service at the plant of the Gould Coupler Co. The Bethlehem plant is operating five, the Republic plant two and the Wickwire Spencer plant two.

### Old Material

Almost all of the large users of scrap have suspended shipments, and the scrap market is therefore virtually at a standstill. No important change in the situation is expected before January. Sales of the week included a small lot of stove plate at \$9.50 and a small lot of mixed cast iron at \$9.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

#### Basic Open-Hearth Grades:

No. 1 heavy melting steel.....	\$10.50 to \$11.00
No. 2 heavy melting scrap.....	9.00 to 9.50
Scrap rails .....	11.00
Hydraulic comp. sheets.....	9.00 to 9.50
Hand bundled sheets.....	8.00 to 8.50
Drop forge flashings.....	9.00 to 9.50
No. 1 busheling.....	9.00 to 9.50
Hvy. steel axle turnings.....	11.00 to 11.50
Machine shop turnings.....	5.50 to 6.00
No. 1 railroad wrought.....	10.00 to 10.50

#### Acid Open-Hearth Grades:

Knuckles and couplers.....	13.00 to 13.50
Coil and leaf springs.....	13.00 to 13.50
Rolled steel wheels .....	13.00 to 13.50
Low phos. billet and bloom ends .....	15.00 to 15.50

#### Electric Furnace Grades:

Short shov. steel turnings.....	8.50 to 9.00
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#### Blast Furnace Grades:

Short mixed borings and turnings .....	7.00 to 7.50
Cast iron borings .....	7.00 to 7.50
No. 2 busheling .....	6.00

### Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Soft steel bars.....	3.15c.
Reinforcing bars .....	2.95c.
Cold-fin. flats and sq. ....	3.65c.
Rounds and hex.....	3.15c.
Cold-rolled strip steel.....	5.85c.
Black sheets (No. 24).....	4.20c.
Galv. sheets (No. 24).....	4.60c.
Bands .....	3.50c.
Hoops .....	3.90c.
Blue ann'd sheets (No. 10).....	3.50c.
Com. wire nails, base per keg.....	\$2.60
Black wire, base per 100 lb.....	3.20

## Steel Operations at Low Rate—Pig Iron Shipments Decline

### Rolling Mill Grades:

Steel car axles .....	15.00 to 15.50
Iron axles .....	16.00 to 16.50

### Cupola Grades:

No. 1 machinery cast.....	10.25 to 11.00
Stove plate .....	9.50 to 10.00
Locomotive grate bars.....	8.25 to 9.25
Steel rails, 3 ft. and under .....	15.00 to 15.50
Cast iron carwheels.....	13.50 to 14.00

### Malleable Grades:

Industrial .....	11.00 to 12.00
Railroad .....	11.00 to 12.00
Agricultural .....	11.00 to 12.00

### Special Grades:

Chemical borings .....	10.50 to 11.00
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## Canada

### Pig Iron Buying in Small Lots Only

**T**ORONTO, Dec. 16.—Spot buying continues to dominate in Canadian pig iron markets. However, inquiries are beginning to appear from some of the larger consumers for first quarter. Sales for the week were in lots of one or two cars, with a total of not more than 500 tons. Prices are unchanged.

Prices per gross ton:

#### Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75.....	\$22.60
No. 2 fdy., sil. 1.75 to 2.25.....	22.10
Malleable .....	22.60

#### Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75.....	\$24.00
No. 2 fdy., sil. 1.75 to 2.25.....	23.50
Malleable .....	24.00
Basic .....	20.50

### Old Material

Trading in iron and steel scrap shows very little change. Practically no business is being done in steel grades in the Toronto district. Montreal dealers, however, report some movement in steel grades, both for domestic consumption and for export. Prices are unchanged.

Dealers' buying prices for old material:  
Per Gross Ton

	Toronto	Montreal
Heavy melting steel.....	\$7.00	\$6.00
Rails, scrap.....	7.00	6.00
No. 1 wrought.....	6.00	8.00
Machine shop turnings.....	2.00	2.00
Bottle plate .....	5.00	4.50
Heavy axle turnings.....	2.50	2.50
Cast borings .....	2.00	2.00
Steel borings .....	2.00	2.00
Wrought pipe .....	2.00	2.00
Steel axles .....	7.00	9.00
Axles, wrought iron.....	7.00	11.00
No. 1 machinery cast.....	10.00	10.00
Stove plate .....	8.00	8.00
Standard carwheels.....	8.50	8.50
Malleable .....	8.00	8.00

#### Per Net Ton

No. 1 mach'ry cast.....	11.00	.....
Stove plate .....	9.00	.....
Standard carwheels.....	10.00	.....
Malleable scrap.....	9.00	.....

Philadelphia office of the Lincoln Electric Co., Cleveland, has been moved into larger quarters in the Commerce Building. D. C. Anderson is in charge.

## Youngstown

### Steel Operations Low—Two Blast Furnaces Go Out

**Y**OUNGSTOWN, Dec. 16.—Iron and steel operations in the Youngstown district dropped this week to the lowest level of the year. The Youngstown Sheet & Tube Co. has suspended two blast furnaces at its Campbell works for the remainder of the year. Both the Sheet & Tube company and the Republic Steel Corp. report 35 per cent operations. The Carnegie Steel Co. and the New-ton Steel Co. are operating at a 50 per cent average, with Sharon Steel Hoop at 55 per cent. At Niles, the Mahoning Valley Steel Co. is operating six mills, with all crews working four 6-hr. shifts under a plan of rotation recently adopted to provide as much employment as possible for all of the company's workers. The Republic Steel Corp. is likewise extending this plan at its various plants.

Suspension of the Sheet & Tube stacks leaves but six of 34 district blast furnaces in service, while 18 of 51 independent open-hearth furnaces are active. There is enlarged activity in tin plate departments of Valley plants, with buying for first quarter shipment in larger volume. It is expected that the blast furnace at Lowellville of the Sharon Steel Hoop Co. and the stack at Warren of the Cliffs Corp. will get under way in January, as demands for hot metal grow.

### Building Contracts Drop Sharply in November

November contracts for new construction of all types awarded in the 37 States east of the Rocky Mountains totaled \$253,573,700, according to F. W. Dodge Corp. This compared with \$337,301,400 in October and \$391,012,500 in November, 1929. Of the November, 1930, total \$101,096,000 was for new non-residential buildings, \$80,781,900 for residential structures, and \$71,695,800 for public works and utilities. Total new construction contracted for during the 11 elapsed months of 1930 was valued at \$4,275,598,600, compared with \$5,437,922,400 for the corresponding 11 months of 1929.

Production of ferroalloys in Canada at 5174 tons in October was 72 per cent over the 3012 tons of the previous month. For the year to date the output totaled 59,877 tons as compared with 72,649 tons during the first ten months of last year and 35,541 tons during the corresponding period of 1928.

Ludlum Steel Co., Watervliet, N. Y., has voted to defer payments of dividends on its preferred stock.



## Mill Prices of Semi-Finished Steel

	<i>Per Gross Ton</i>
Rerolling, 4-in. and under 10-in., Pitts- burgh .....	\$31.00
Rerolling, 4-in. and under 10-in., Youngs- town .....	31.00
Rerolling, 4-in. and under 10-in., Cleve- land .....	31.00
Rerolling, 4-in. and under 10-in., Chicago.	32.00
Forging quality, Pittsburgh.	36.00

	<i>Per Gross Ton</i>
Pittsburgh .....	\$31.00
Youngstown .....	31.00
Cleveland .....	31.00

Pittsburgh .....	\$31.00
Youngstown .....	31.00
Cleveland .....	31.00

	Per Lb.
Grooved .....	1.60c.
Universal .....	1.60c.
Sheared .....	1.60c.

	(Common soft, base)	Per Gross Ton
Pittsburgh .....		\$35.00
Cleveland .....		35.00
Chicago .....		36.00

Lake Superior Ores, Delivered Lower  
Lake Ports

Old range Bessemer, 51.50% iron.....	\$4.80
Old range non-Bessemer, 51.50% iron.....	4.65
Mesabi Bessemer, 51.50% iron.....	4.65
Mesabi non-Bessemer, 51.50% iron.....	4.50
High phosphorus, 51.50% iron.....	4.40
<i>Foreign Ore, c.i.f. Philadelphia or Baltimore</i>	

Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algeria.	8c. to 9c.
Iron ore, low phos., Swedish, average 68% iron	11c.
Iron ore, basic Swedish, average 65% iron	9c.
Manganese ore, washed 52% manganese, from the Caucasus	26c. to 28c.
Manganese ore, Brazilian, African or Indian, basic 50%	26c. to 28c.
Tungstenore, high grade, per unit, in 60% concentrates	\$12.50 to \$13.00

Chrome ore, 45 to 50% $\text{Cr}_2\text{O}_3$ crude, c.i.f.	Per Gross Ton
Atlantic seaboard .....	\$22.00 to \$24.00
	Per Lb.
Molybdenum ore, 85% concentrates of	
$\text{MoS}_2$ delivered .....	50c. to 55c.

	Coke	Per Net Ton
Furnace, f.o.b. Connellsville prompt		\$2.50
Foundry, f.o.b. Connellsville prompt		\$3.25 to 4.75
Foundry, by-products, Chgo ovens		8.00
Foundry, by-products, New England, del'd		11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to	9.40
Foundry, by-product, Phila.		5.00
Foundry, Birmingham		5.00
Foundry, by-product, St. Louis, f.o.b. ovens		8.00
Foundry by prod., del'd St. Louis		9.00

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	\$1.35 to \$1.50
Mine run coking coal, f.o.b. W. Pa. mines	1.40 to 1.50
Gas coal, 3/4-in., f.o.b. Pa. mines.	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines.	.65 to .75
Gas slack, f.o.b. W. Pa. mines.	1.00 to 1.10

	<i>Per Gross Ton</i>
Domestic, 80%, seaboard.....	\$80.00 to \$85.00
Foreign, 80%, Atlantic or Gulf port, duty paid.....	

Per Gross Ton Furnace	
Domestic, 19 to 21%.....	\$28.00 to \$30.00

Per Gross Ton Delivered	
50%	\$83.50
75%	130.00

Per Gross Ton Furnace		Per Gross Ton Furnace	
10%	\$35.00	12%	\$39.00
11%	37.00	14 to 16%	39.00

F.o.b. Jackson County, Ohio, Furnace			
	Per Gross Ton		Per Gross Ton
10%	\$25.00	13%	\$29.00
11%	26.00	14%	31.00
12%	27.00	15%	33.00

F.o.b. Jackson County, Ohio, Furnace			
Per Gross Ton		Per Gross Ton	
6%	\$21.00	11%	\$24.00
7%	21.50	12%	25.00
8%	22.00	13%	27.00
9%	22.50	14%	29.00
10%	23.00	15%	31.00

Ferrotungsten, per lb. contained metal	
del'd	\$1.30 to \$1.40
Ferrochromium, 4 to 6% carbon and up,	
65 to 70% Cr., per lb. contained Cr.	
delivered, in carloads	11.00
Ferrochromium, 2% carbon	17.00, to 17.50
Ferrochromium, 1% carbon	19.00, to 20.00
Ferrochromium, 0.10% carbon	24.50, to 26.00
Ferrochromium, 0.06% carbon	26.50, to 28.00
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	\$3.15 to \$3.60
Ferrocobaltitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	\$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18% Rockdale, Tenn., base, per gross ton	\$91.00
Ferrophosphorus, electric 24%, f.o.b. Aniston, Ala., per gross ton	\$122.50
Silico-manganese, gross ton, delivered	\$135.00

Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines.....	\$16.00
No. 2 lump, Illinois and Kentucky mines..	20.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid .....	\$17.00 to 17.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines.....	32.50

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania ...	\$43.00 to \$46.00	\$35.00 to \$38.00
Maryland .....	43.00 to 46.00	35.00 to 38.00
New Jersey ...	50.00 to 65.00	.....
Ohio .....	43.00 to 46.00	35.00 to 38.00
Kentucky .....	43.00 to 46.00	35.00 to 38.00
Missouri .....	43.00 to 46.00	35.00 to 38.00
Illinois .....	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton.....	7.00	

	Per 1000 f.o.b. Works
Pennsylvania .....	\$43.00
Chicago .....	52.00
Birmingham .....	50.00
Silica clay, per ton.....	\$8.50 to 10.00

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa. ....	\$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa. ....	40.00
Standard size .....	45.00

	<i>Per Net Ton</i>
Standard size .....	\$45.00

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

†Machine bolts .....	78
†Carriage bolts .....	78
Lag bolts .....	78
Plow bolts, Nos. 1, 2, 3 and 7 heads.....	78
Hot-pressed nuts, blank or tapped, square.....	73
Hot-pressed nuts, blank or tapped, hexagons.....	73
C.p.c. and t. square or hex. nuts, blank or tapped .....	73
Washers* .....	7.00c. to 6.75c. per lb. off list

†Bolts with rolled thread up to and including  $\frac{3}{8}$  in. x 6 in. take 10 per cent lower list prices.

	Per Cent Off List
Semi-finished hexagon nuts.....	73
Semi-finished hexagon castellated nuts, S.A.E.....	73
Stove bolts in packages, P.g.h.....	80, 10, 10 and 5
Stove bolts in packages, Chicago.....	80, 10, 10 and 5
Stove bolts in packages, Cleveland.....	80, 10, 10 and 5
Stove bolts in bulk, P.g.h.....	80, 10, 10, 5 and 2 1/2
Stove bolts in bulk, Chicago.....	80, 10, 10, 5 and 2 1/2
Stove bolts in bulk, Cleveland.....	80, 10, 10, 5 and 2 1/2
Tire bolts.....	60, 10 and 10

	(1½-in. and larger)	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland.....		\$2.75
F.o.b. Chicago .....		2.85

## (1/8-in. and smaller)

	<i>Per Cent Off List</i>
F.o.b. Pittsburgh .....	.70, 10 and 5
F.o.b. Cleveland .....	.70, 10 and 5
F.o.b. Chicago .....	.70, 10 and 5

(Freight allowed up to but not exceeding 50c.  
per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws.....	80, 10, 10 and 5
Milled standard set screws, case hardened.....	80 and 5
Milled headless set screws, cut thread.....	75 and 10
Upset hex. head cap screws, U.S.S. thread.....	85 and 10
Upset hex. cap screws, S.A.E. thread.....	85 and 10
Upset set screws.....	80, 10 and 5
Milled studs.....	70

# ▲▲▲ Mill Prices of Finished Iron and Steel Products ▲▲▲

## Iron and Steel Bars

Soft Steel	
	Base per Lb.
F.o.b. Pittsburgh mill.....	1.60c. to 1.65c.
F.o.b. Chicago.....	1.70c.
Del'd Philadelphia.....	1.89c.
Del'd New York.....	1.93c.
F.o.b. Cleveland.....	1.60c. to 1.65c.
F.o.b. Lackawanna.....	1.70c.
F.o.b. Birmingham.....	1.75c. to 1.80c.
C.i.f. Pacific ports.....	2.25c.
F.o.b. San Francisco mills.....	2.25c.

## Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.....	1.70c.
F.o.b. Birmingham, mill lengths.....	1.75c. to 1.80c.

## Rail Steel

F.o.b. mills, east of Chicago dist.....	1.50c. to 1.55c.
F.o.b. Chicago Heights mill.....	1.60c. to 1.65c.
Del'd Philadelphia.....	1.84c. to 1.89c.

## Iron

Common iron, f.o.b. Chicago.....	1.70c.
Refined iron, f.o.b. P'gh mills.....	2.75c.
Common iron, del'd Philadelphia.....	2.09c.
Common iron, del'd New York.....	2.14c.

## Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.60c. to 1.65c.
F.o.b. Chicago.....	1.70c.
F.o.b. Birmingham.....	1.75c. to 1.80c.
Del'd Cleveland.....	1.78½c. to 1.83½c.
Del'd Philadelphia.....	1.80½c.
F.o.b. Coatesville.....	1.70c.
F.o.b. Sparrows Point.....	1.70c.
F.o.b. Lackawanna.....	1.70c.
Del'd New York.....	1.88c.
C.i.f. Pacific ports.....	2.05c.

## Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.60c. to 1.65c.
F.o.b. Chicago.....	1.70c.
F.o.b. Birmingham.....	1.75c. to 1.80c.
F.o.b. Lackawanna.....	1.70c.
F.o.b. Bethlehem.....	1.70c.
Del'd Cleveland.....	1.78½c. to 1.83½c.
Del'd Philadelphia.....	1.71c. to 1.76c.
Del'd New York.....	1.85½c.
C.i.f. Pacific ports.....	2.15c. to 2.25c.

## Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh.....	1.65c. to 1.70c.
Wider than 6 in., P'gh.....	1.55c. to 1.60c.
6 in. and narrower, Chicago.....	1.75c. to 1.80c.
Wider than 6 in., Chicago.....	1.65c. to 1.70c.
Cooperage stock, P'gh.....	1.90c.
Cooperage stock, Chicago.....	2.00c.

## Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill.....	2.00c. to 2.10c.
Bars, f.o.b. Chicago.....	2.00c. to 2.10c.
Bars, Cleveland.....	2.00c. to 2.10c.
Bars, Buffalo.....	2.00c. to 2.10c.
Shafting, ground, f.o.b. mill.....	2.45c. to 3.40c.
Strips, P'gh.....	2.25c. to 2.35c.
Strips, Cleveland.....	2.25c. to 2.35c.
Strips, deliv'd Chicago.....	2.53c. to 2.63c.
Strips, Worcester.....	2.50c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland.....	3.40c.

\*According to size.

## Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

### To Merchant Trade

	Base per Keg
Standard wire nails.....	\$1.90 to \$2.00
Cement coated nails.....	1.90 to 2.00
Galvanized nails.....	3.95 to 4.05

	Base per Lb.
Polished staples.....	2.35c. to 2.45c.
Galvanized staples.....	2.60c. to 2.70c.
Barbed wire, galvanized.....	2.55c. to 2.65c.
Galvanized fence wire.....	2.05c. to 2.15c.
Annealed wire, No. 9.....	2.50c. to 2.60c.
Woven wire fence (per net ton to retailers).....	\$65.00

### To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage.....	2.20c. to 2.30c.
Spring wire.....	3.30c.

	Base per Lb.
Wire nails.....	\$1.95 to \$2.05
Annealed fence wire.....	2.30c. to 2.40c. (lb.)
Bright hard wire to manufacturing trade.....	2.25c. to 2.35c.

Anderson, Ind., mill prices are ordinarily \$1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill \$2 a ton over Pittsburgh, and Birmingham mill \$3 a ton over Pittsburgh.

## Light Plates

	Base per Lb.
No. 10, blue annealed, f.o.b. P'gh.....	1.90c. to 2.00c.
No. 10, blue annealed, f.o.b. Chicago dist.....	2.00c. to 2.10c.
No. 10, blue annealed, del'd Phila.....	2.19c. to 2.29c.
No. 10, blue annealed, B'ham.....	2.05c. to 2.10c.

## Sheets

	Base per Lb.
No. 13, f.o.b. P'gh.....	2.05c. to 2.15c.
No. 13, f.o.b. Chicago dist.....	2.15c. to 2.25c.
No. 13, del'd Philadelphia.....	2.34c. to 2.44c.
No. 13, blue annealed, B'ham.....	2.20c. to 2.25c.

### Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh.....	2.35c. to 2.45c.
No. 24, f.o.b. Chicago dist. mill.....	2.45c. to 2.55c.
No. 24, del'd Philadelphia.....	2.64c. to 2.74c.
No. 24, f.o.b. Birmingham.....	2.50c. to 2.55c.

### Steel Furniture Sheets

No. 24, f.o.b. P'gh.....	3.60c.
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### Galvanized

No. 24, f.o.b. Pittsburgh.....	2.90c. to 3.00c.
No. 24, f.o.b. Chicago dist. mill.....	3.00c. to 3.10c.
No. 24, del'd Cleveland.....	3.08½c. to 3.18½c.
No. 24, del'd Philadelphia.....	3.24c. to 3.29c.
No. 24, f.o.b. Birmingham.....	3.15c.

### Continuous Mill Sheets

No. 10 gage.....	1.75c.
No. 13 gage.....	1.90c.

### Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh.....	2.65c. to 2.70c.
No. 28, f.o.b. Chicago dist. mill.....	2.75c. to 2.80c.

### Automobile Body Sheets

No. 20, f.o.b. Pittsburgh.....	3.30c.
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### Long Ternes

No. 24, 8-lb. coating, f.o.b. mill.....	3.35c. to 3.45c.
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### Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh.....	3.70c.
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## Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills.....	\$5.00
Standard cokes, f.o.b. Gary.....	5.10

## Terne Plate

(F.o.b. Morgantown or Pittsburgh)  
(Per Package, 20 x 28 in.)

8-lb. coating I.C. \$10.30	25-lb. coating I.C. \$15.20
15-lb. coating I.C. 12.90	30-lb. coating I.C. 16.00
20-lb. coating I.C. 14.00	40-lb. coating I.C. 17.80

## Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.	
S.A.E. Series Numbers	Alloy Differential
2000 (¼% Nickel).....	\$0.25
2100 (1½% Nickel).....	0.55
2300 (3¼% Nickel).....	1.50
2500 (5% Nickel).....	2.25
3100 Nickel Chromium.....	0.55
3200 Nickel Chromium.....	1.85
3300 Nickel Chromium.....	3.80
3400 Nickel Chromium.....	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum).....	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum).....	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel).....	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium).....	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium).....	0.45
5100 Chromium Spring Steel.....	0.20
6100 Chromium Vanadium Bar.....	1.20
6100 Chromium Vanadium Spring Steel.....	0.95
9250 Silicon Manganese Spring Steel (flats).....	0.25
Rounds and squares.....	0.50
Chromium Nickel Vanadium.....	1.50
Carbon Vanadium.....	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

## Rails

	Per Gross Ton
Standard, f.o.b. mill.....	\$43.00
Light (from billets), f.o.b. mill.....	34.00
Light (from rail steel), f.o.b. mill.....	32.00
Light (from billets), f.o.b. Ch'go mill.....	36.00

## Track Equipment

	Base per 100 Lb.
Spikes, ¾ in. and larger.....	\$2.80
Spikes, ½ in. and larger.....	2.80

Spikes, boat and barge.....	\$3.00
Tie plate, steel.....	1.95
Angle bars.....	2.75
Track bolts, to steam railroads.....	\$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count.....	73 per cent off list

## Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld		Iron	
Inches	Steel	Inches	Black Galv.
¼.....	47	¼ and ¾.....	+36
½.....	53	¾.....	23
¾.....	58	1.....	28
1.....	62	1 and 1½.....	31
1 to 3.....	64	1½ and 2.....	35
Lap Weld			
2.....	57	2.....	23
2½ to 6.....	61	2½ to 3½.....	28
7 and 8.....	58	4 to 6.....	30
9 and 10.....	56	7 and 8.....	29
11 and 12.....	55	9 to 12.....	26
Butt Weld, extra strong, plain ends			
¼.....	43	¼ and ¾.....	+48
½.....	49	¾.....	23
¾.....	55	1.....	28
1.....	60	1 to 2.....	34
1 to 1½.....	62		12
2 to 3.....	63		18
Lap weld, extra strong, plain ends			
2.....	55	2.....	29
2½ to 4.....	59	2½ to 4.....	34
4½ to 6.....	58	4½ to 6.....	33
7 to 8.....	54	7 and 8.....	31
9 and 10.....	47	9 to 12.....	21
11 and 12.....	46		8

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discount of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

## Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2½ in.....	38	1½ in.....	1
2½ in.—2¾ in.....	46	1¾ in.....	8
3 in.....	52	2 in.—2¼ in.....	18
3½ in.—3¾ in.....	54	2½ in.—2¾ in.....	16
4 in.....	57	3 in.....	17
4½ in. to 6 in.....	46	3½ in. to 3¾ in.....	18
		4 in.....	20
		4½ in.....	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

### Standard Commercial Seamless Boiler Tubes

Cold Drawn	
1 in.....	61
1½ to 1¾ in.....	53
1¾ in.....	37
2 to 2½ in.....	32
2½ to 3 in.....	40
3 in.....	52
3½ to 3¾ in.....	48
4 in.....	51
4½, 5 and 6 in.....	40

### Hot Rolled

2 and 2½ in.....	38
2½ and 2¾ in.....	46
3 in.....	52

Beyond the above base discount a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

## Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads).....	55
Carbon, 0.30% to 0.40% base.....	50
Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.	



## Fabricated Structural Steel

### New Projects 23,500 Tons Compared With 91,000 Tons a Week Ago—Airship Dock Takes 9570 Tons

**N**EW projects requiring fabricated structural steel declined this week to 23,500 tons from 91,000 tons a week ago, and awards dropped from 53,000 tons a week ago to 29,500 tons this week. Included in new projects are 9570 tons in an airship dock at New York for the International Zeppelin Transportation Corp., 1200 tons for an office building at Sixth Avenue and Forty-first Street, New York, and 2400 tons for the Roosevelt Hotel at Wichita, Kan.

Awards of structural steel were generally small except for 7000 tons in a penitentiary at Riker's Island, New York, 5100 tons in a New York subway section, 3000 tons in welded pipe for Los Angeles and 2400 tons in approaches to an Ohio River bridge at Evansville, Ind.

The Structural Steel Board of Trade, New York, reports a total of 25,513 tons of structural steel placed in the New York district in November, compared with 30,948 tons in October. The largest total this year was in May, with 58,431 tons. Awards follow:

#### North Atlantic States

BOSTON, 2300 tons, Professional Arts building, to New England Structural Co.  
STATE OF MASSACHUSETTS, 400 tons, highway bridges, to Bethlehem Steel Co.  
NEW YORK, 5100 tons, route 107, section 8, subway, to the American Bridge Co.  
NEW YORK, 7000 tons, penitentiary at Riker's Island, to National Bridge Co.  
BROOKLYN, 1110 tons, Harway Avenue bridge, to Bethlehem Steel Co.  
ITHACA, N. Y., 330 tons, school, to Kellogg Structural Steel Co.  
SYRACUSE, N. Y., 700 tons, office building and garage, to American Bridge Co.  
ROCHESTER, N. Y., 600 tons, Y. M. H. A. building, to F. L. Hughes Co.  
BALTIMORE, 580 tons, State tobacco warehouse, to Dietrich Brothers.

#### The South

BIRMINGHAM, 1600 tons, two underpasses for city, to Ingalls Iron Works.

#### Central States

OTSEGO, MICH., 250 tons, highway bridge, to Massillon Structural Steel Co.  
LANSING, MICH., 160 tons, service station for Allied Engineers, Inc., to Flint Structural Steel Co.  
TOLEDO, 410 tons, Custom House and Court House, to Massillon Structural Steel Co.  
CHILLICOTHE, OHIO, 245 tons, dormitories and warehouse for United States Department of Justice, to Berger Iron Works.  
EVANSVILLE, IND., 2400 tons, approaches to Ohio River bridge, to R. C. Mahon Co.  
CHICAGO, 300 tons, Rock Island Railroad, to American Bridge Co.  
BERLIN, WIS., 300 tons, bridge, to Worden-Allen Co.  
MILWAUKEE, 325 tons, Wrought Washer Co., to Milwaukee Structural Steel Co.  
ALGOA, MO., 250 tons, intermediate reformatory for Missouri State Prison Board, to LaSalle Iron Works.

#### Western States

OMAHA, NEB., 300 tons, viaduct for Union Pacific Railroad, to Paxton & Vierling Iron Works.  
OGDEN, UTAH, 300 tons, Court House, to Denver Iron & Steel Co.  
PASADENA, CAL., 100 tons, school addition, to Minneapolis-Moline Power & Implement Co.  
LOS ANGELES, 750 tons, theater, to Consolidated Steel Corp.

LOS ANGELES, 3000 tons, plates, 38 and 51-in. welded steel pipe, to Western Pipe & Steel Co.

LONGVIEW, WASH., 600 tons, plates for Weyerhaeuser Timber Co., to Willamette Iron & Steel Works.

#### STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

#### North Atlantic States

NEWTON, MASS., 100 tons, Bigelow school.  
REVERE, MASS., 138 tons, State bridge.  
NEW YORK, 9570 tons, airship dock for International Zeppelin Transportation Corp.  
NEW YORK, 1000 tons, apartment building, West Ninety-sixth Street.  
NEW YORK, 1200 tons, office building, Sixth Avenue and Forty-first Street.  
BROOKLYN, 260 tons, administration building at Floyd Bennett airport on Flatbush Avenue.  
ROCHESTER, N. Y., 600 tons, Washington Junior High School.  
PITTSBURGH, 810 tons, Arsenal High School.  
PITTSBURGH, 520 tons, apartment building for Navaro Co.  
HARRISBURG, PA., 500 tons, Medical Arts building.  
WILMINGTON, DEL., 500 tons, Fidelity Building.  
OIL CITY, PA., 985 tons, buildings for National Transit Co.; Rogers Structural Steel Co., low bidder.

#### The South

BATON ROUGE, LA., 4000 tons, State Capitol; Geo. A. Fuller Co., Washington, general contractor.  
ROCKPORT, KY., 700 tons, bridge for Illinois Central Railroad.

#### Central States

CLEVELAND, 300 tons, two temporary bridges for city.  
CLEVELAND, unstated tonnage, mill and other buildings for Otis Steel Co.  
CLEVELAND, 350 tons, factory building for Yoder Co.  
CINCINNATI, 500 tons, addition to Union Trust building.  
CHICAGO, 2500 tons, South Halsted Street bridge.  
CHICAGO, 350 tons, Mozart School.  
CHICAGO, 200 tons, Moody Bible Institute.  
DES MOINES, IOWA, 2400 tons, bank building, previously reported at 1800 tons.

ST. LOUIS, 1000 tons, *Star Chronicle* building.

UNION PACIFIC RAILROAD, 1000 tons, bridges.

#### Western States

WICHITA, KAN., 2400 tons, Roosevelt Hotel.  
PASADENA, CAL., 1300 tons, auditorium; bids postponed until Dec. 22.  
SANTA ROSA, CAL., 365 tons, bridge over Russian River; bids Dec. 23.  
SAN JOSE, CAL., 225 tons, subway for Southern Pacific Co.; bids Dec. 22.

### Otis Steel Co. to Build Continuous Sheet Mill

The Otis Steel Co., Cleveland, has placed a contract for a continuous sheet mill, and plans to start about Feb. 1 the erection of a 200-ft. extension to the blooming and bar mill at its Riverside plant to provide room for the mill. The mill will be built and operated under a license secured some time ago from the American Rolling Mill Co. to use its continuous sheet mill process. The mill will be built by the United Engineering & Foundry Co., Pittsburgh. It will be a 72-in. mill consisting probably of three 2-high, two 3-high and four 4-high stands. A reheating furnace will be purchased shortly.

### Further Weakness in Scrap at Detroit

DETROIT, Dec. 16.—Lack of interest on the part of consumers has brought a decline of 25c. a ton in heavy melting steel and several other items. Dealers would not be surprised if further weakness develops before the end of the month.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov.	
steel	\$9.50 to \$10.00
Borings and short turnings	4.75 to 5.25
Long turnings	3.75 to 4.25
No. 1 machinery cast	10.00 to 10.50
Automotive cast	11.50 to 12.00
Hydraulic comp. sheets	9.00 to 9.50
Stove plate	7.25 to 7.75
New No. 1 busheling	8.00 to 8.50
Old No. 2 busheling	3.50 to 4.00
Sheet clippings	6.00 to 6.50
Flashings	7.75 to 8.25

### Radiator and Boiler Prices Advanced

The American Radiator Co. has announced an advance of 2c. a ft. (6 to 7 per cent) on radiation and advances of 5 per cent on boilers, Arcola heaters and water heaters. Several other manufacturers have followed the lead of the American Radiator Co.

### 19 Destroyers To Be Sold

WASHINGTON, Dec. 16.—The Navy Department has announced that bids will be received on Jan. 10 for 19 decommissioned destroyers at the Philadelphia Navy Yard.

# ▲▲▲ Non-Ferrous Metal Markets ▲▲▲

## Copper Lower—Tin at New Low—Lead Steady— Zinc Weak

NEW YORK, Dec. 16.

### Copper

Prices for electrolytic copper have declined almost daily in the past week and demand is so light that it is difficult to quote accurate prices. A week ago custom smelters were quoting 11c., delivered in the Connecticut Valley, and primary producers were holding their price at 12c. On Dec. 10 the latter lowered the export quotation to 11.30c., c.i.f. usual European ports, which automatically placed the domestic price at 11c. Since then certain custom smelters, but not all of them, began lowering their asking price until yesterday it was 10c., with some metal available from second hands at 9.75c., delivered in the Connecticut Valley. Small sales are reported at both of these levels. Yesterday the export price was again reduced by Copper Exporters, Inc., to 10.80c., bringing the nominal quotation of primary producers to 10.50c., delivered in the Connecticut valley. Under the circumstances, buying by foreigners has naturally been light, so that total foreign sales for the month are about 8000 tons to date. There is practically no demand for Lake copper and some producers are not quoting.

Summarizing the situation, quotations are nominally as follows: Electrolytic copper, delivered in the Connecticut Valley, 10c.; copper for export, 10.80c., c.i.f. usual European ports; Lake copper, 10.50c. to 10.62½c., delivered; quotation of primary producers, 10.50c., delivered in the Connecticut Valley.

An encouraging feature is the publication of statistics for November. These showed a decrease in copper above ground of close to 11,000 tons, the decrease in blister copper having been 16,000 tons, and the increase in stocks of refined metal about 4700 tons. These figures reflect in part the curtailment program adopted recently, but it is believed that December will more clearly reveal the effects of the curtailment.

### Tin

Spot Straits tin was sold yesterday at 23.62½c., New York, the lowest price in more than 25 years. The quotation at the most recent low level several months ago was 24.62½c.

The market has been declining nearly every day in the past week and, on the decline, consumers have been buying fair quantities for future delivery, following a custom which has usually prevailed on such breaks. The

### THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Dec. 16	Dec. 15	Dec. 13	Dec. 12	Dec. 11	Dec. 10
Lake copper, New York.....	10.62½	11.12½	11.12½	11.12½	11.12½	11.12½
Electrolytic copper, N. Y.*.....	9.75	9.75	10.00	10.25	10.75	10.75
Straits tin, spot, N. Y. ....	23.75	23.62½	...	24.30	24.20	25.05
Zinc, East St. Louis.....	4.00	4.05	4.05	4.10	4.15	4.17½
Zinc, New York.....	4.35	4.40	4.40	4.45	4.50	4.52½
Lead, East St. Louis.....	4.95	4.95	4.95	4.95	4.95	4.95
Lead, New York.....	5.10	5.10	5.10	5.10	5.10	5.10

\*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

decline started with a big break in the London market on Dec. 11. This was caused by an announcement that the Dutch Government had shipped 3000 tons of Banca tin from the East for storage in Holland, the reason being that storage space in Batavia is scarce. The inference from this was that there is a large supply of tin left there. It was also pointed out that the 3000 tons was being removed from the invisible supply to the visible supply.

Another factor in the decline was the failure of a New York bank. These two events gave the bears their opportunity in the London market. London prices today are the lowest in many years, at £105 10s. for spot standard, £106 15s. for future standard, and £109 15s. for spot Straits, with the quotation at Singapore, £109

17s. 6d. It should be added that the situation in copper in this country was also influential in the decline of tin.

Stocks in British storehouses on Dec. 13 were 22,266 tons and shipments from the Straits for the first half of December were 3405 tons, a large total. Too much tin and too little consumption is the story, briefly told.

### Lead

This is the only major metal market in which prices have been stable for a long time. Quotations are unchanged at 4.95c., St. Louis, or 5.10c., New York, which is the contract price of the leading interest. Demand, which is light, is confined to carload and small lots for early delivery. Although books have been opened all this

### New York, Chicago or Cleveland Warehouse

#### Delivered Prices, Base per Lb.

High brass .....	17.67½c.
Copper, hot rolled, base sizes.....	20.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes.....	22.25c.
Seamless Tubes—	
Brass .....	22.50c.
Copper .....	21.75c.
Brass Rods .....	15.87½c.
Brazed Brass Tubes.....	25.12½c.

### New York Warehouse

#### Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks .....	9.75c. to 10.25c.
Zinc sheets, open.....	10.75c. to 11.25c.

### Metals from New York Warehouse

#### Delivered Prices, per Lb.

Tin, Straits pig.....	26.50c. to 27.50c.
Tin, bar .....	29.50c. to 30.50c.
Copper, Lake .....	12.00c. to 12.50c.
Copper, electrolytic .....	12.00c. to 12.50c.
Copper, casting .....	11.75c. to 12.25c.
Zinc, slab .....	5.75c. to 6.75c.
Lead, American pig.....	6.00c. to 7.00c.
Lead, bar .....	8.00c. to 9.00c.
Antimony, Asiatic .....	9.50c. to 10.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure).....	24.00c. to 25.00c.
Alum. ingots, No. 12 alloys .....	23.00c. to 24.00c.
Babbitt metal, commercial grade .....	25.00c. to 26.00c.
Solder, ½ and ½.....	18.50c. to 19.50c.

### Metals from Cleveland Warehouse

#### Delivered Prices, per Lb.

Tin, Straits pig.....	28.75c.
Tin, bar .....	30.75c.
Copper, Lake .....	13.13c.
Copper, electrolytic .....	13.13c.
Copper, casting .....	12.75c.
Zinc, slab .....	5.50c. to 5.75c.
Lead, American pig.....	5.75c. to 6.00c.
Lead, bar .....	8.50c.
Antimony, Asiatic .....	11.50c.
Babbitt metal, medium grade.....	15.25c.
Babbitt metal, high grade.....	33.50c.
Solder, ½ and ½.....	19.25c.

### Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible .....	8.25c.	9.25c.
Copper, hvy. and wire .....	8.00c.	9.25c.
Copper, light and bottoms .....	7.00c.	8.00c.
Brass, heavy .....	4.75c.	6.00c.
Brass, light .....	3.75c.	5.00c.
Hvy. machine composition .....	7.00c.	8.25c.
No. 1 yel. brass turnings .....	4.75c.	5.50c.
No. 1 red brass or compos. turnings.....	6.75c.	7.75c.
Lead, heavy .....	4.00c.	4.50c.
Lead, tea .....	2.50c.	3.00c.
Zinc .....	2.25c.	2.75c.
Sheet aluminum.....	7.50c.	9.50c.
Cast aluminum .....	5.00c.	7.50c.



month for January shipment, very few orders have been placed and the amount of possible business is an encouraging factor.

## Zinc

In the absence of demand, prices of prime Western zinc have continued to decline until they are down practically to 4c. to 4.05c., East St. Louis, or 4.35c. to 4.40c., New York. This is very close to the low point on the last movement, when 3.95c. was touched several weeks ago. Prices for future delivery are at a slight premium, although in some cases metal for the first quarter could probably be obtained at the prompt asking price.

Ore is unchanged at \$25 to \$26. Joplin. Production was maintained at 8000 tons for the week ended Dec. 13, with shipments at 7320 tons, and sales at 6470 tons.

## Antimony

In a quiet but steady market, Chinese metal is quoted unchanged for prompt and December arrival, at 7.10c., New York, duty paid, with futures at 6.90c.

## Reinforcing Steel

### Chicago Viaduct Will Require 2400 Tons

CONTRACTS for reinforcing steel the past week, at 920 tons, were the smallest since Sept. 4 and included no tonnage of size. New projects will take 6400 tons; the largest, 2400 tons, is for a viaduct at Chicago. A subway in Brooklyn calls for 1400 tons. Awards follow:

FALL RIVER, MASS., 100 tons, Post Office, to an unnamed company.  
NEW YORK, 220 tons, municipal health center, Worth, Center, Leonard and Lafayette Streets, to McClintic-Marshall Co.  
PARKTON, MD., 150 tons, Pretty Boy dam, to Concrete Steel Co.  
OAKLAND, CAL., 350 tons, Paramount Theater, to Soule Steel Co.  
LOS ANGELES, 100 tons, apartment building, North Menlo Avenue, to Blue Diamond Co.

### Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

NEW YORK, 130 tons, Queens general hospital; John Kennedy & Co., New York, low bidders on general contract.  
NEW YORK, 900 tons, foundations, Riker's Island penitentiary; general contract awarded to P. J. Carlin Construction Co., New York.  
BROOKLYN, 450 tons, subway route 107, section 8; general contract let to Cornell Contracting Corp., New York.  
BROOKLYN, 1400 tons, subway route 107, section 9; general contract bids taken Dec. 16.  
NEW YORK, 980 tons, subway route 108, sections 9 and 10, Queens Boulevard, Queens; general contract bids Dec. 22.  
PORT CHESTER, N. Y., 200 tons, high school; Rathgeb-Walsh, Inc., general contractor.

## Nickel

Wholesale lots of ingot nickel are quoted at 35c. a lb., with shot nickel at 36c. and electrolytic nickel in cathodes, at 35c.

## Aluminum

Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 22.90c. a lb., delivered.

### Non-Ferrous Metals at Chicago

CHICAGO, Dec. 16.—This market has quieted decidedly, following sharp reductions in prices on copper and tin. The old metal market is dull with prices generally lower except on lead.

Prices per lb. in carload lots: Lake copper, 11.12½c.; tin, 24.50c.; lead, 5.05c.; zinc, 4.15c.; in less-than-carload lots, antimony, 8.25c. On old metals we quote copper wire, crucible shapes and copper clips, 7.75c.; copper bottoms, 6.75c. to 7.25c.; red brass, 6.75c. to 7.25c.; yellow brass, 4.75c. to 5.25c.; lead pipe, 3.75c. to 4c.; zinc, 1.25c. to 1.50c.; pewter, No. 1, 14.75c.; tin-foil, 15.75c.; block tin, 21.75c.; aluminum, 6.25c. to 6.75c.; all being dealers' prices for less-than-carload lots.

BATON ROUGE, LA., 1000 tons, State Capitol.  
CHICAGO, 2400 tons, Ogden Avenue viaduct.  
WATERLOO, IOWA, 100 tons, bridge.  
DES MOINES, IOWA, 300 tons, bank building.  
PHOENIX, ARIZ., 200 tons, Valley Bank Building; bids being taken.

## Technical Objectives of Gray Iron Institute

The immediate objectives of the newly formed technical department of the Gray Iron Institute are listed in a recent bulletin released by the institute. Oliver Smalley, technical director, outlines the following pieces of work to be undertaken immediately:

1. To elevate the standards of gray cast iron.
2. To study and advise on specifications.
3. To collaborate with other technical societies and committees with the objects of bringing to the members all that is being done in the way of committee work, keeping them fully informed of progress and developments.
4. To make a survey of the test bar position in the light of modern engineering advance and needs.
5. To commence testing the bars that have been submitted by the members of the institute and report the result of these tests in the form of a bulletin, which it is expected will give some information on the test bar position in the average gray iron foundry and what it means.
6. Establishing specifications. This will not only correctly identify the

properties required of a casting, but will suitably classify gray cast iron, differentiating between ornamental, general construction, high test, wear, toughness, corrosion resistance, heat resisting, and such properties as may be necessary so that any buyer of castings purchasing from a certified gray cast iron foundry will be able to feel secure.

7. Undertake a plan of campaign that will elevate the tone of the member foundries, for the success of the above depends no more nor less on the group action of members and their willingness not only to cooperate, but also to lead.
8. Organize a consulting and information department which will permit the various members to present their problems and also to avail themselves of authoritative references on gray iron.
9. Issue from time to time research and instruction bulletins having to do with matters of interest and pertinence to our members.
10. When a member is intending a new line of endeavor, we are at his disposal to offer advice before he spends, and to guide him by personal assistance wherever necessary.
11. To arrange for lectures, articles, advertisements and propaganda that will bring "Cast Iron" to the standards the institute has in mind, and create in the minds of the buyer, user, engineer and designer the desire to specify and purchase only certified gray cast iron.
12. To exchange information with the various technical and foundry institutions so as to avoid overlapping and get results.
13. To broaden present uses for gray iron and develop, through various methods, new uses for the product.

## Railroad Equipment

### Santa Fe Places Orders for 1522 Freight Cars

ORDERS of the Atchison, Topeka & Santa Fe for 1522 freight cars were the feature of railroad equipment buying during the week. Details follow:

Santa Fe has ordered 1522 cars as follows: 350 box cars each from Pressed Steel Car Co. and General American Tank Car Corp., 300 box cars and 22 cabooses from American Car & Foundry Co., and 500 refrigerator cars from Pullman Car & Mfg. Corp. This road is preparing to buy 16 gas-electric cars.

Brooklyn & Queens Corp., New York, has ordered 50 trolley cars from Osgood-Bradley Car Co., Springfield, Mass.

Canadian National is in the market for 20 locomotives.

Metal bed springs to the value of \$18,117,000 were produced in 1929, according to the Bureau of the Census. The value of box springs was \$5,971,000 and of spring cushions, \$1,321,000.

# Automobile Industry Is Hopeful for Greater Activity Early in 1931

DETROIT, Dec. 15.

**N**EARING the end of the year, Detroit is looking forward with a feeling of hopefulness to 1931. It believes that the coming months cannot have in store anything worse than the last three; and many signs point to an acceleration of industrial operations in 30 to 60 days. Even the fact that Ford and Buick expect to halt for a breathing spell the remainder of the month does not alarm the trade as it would have done a short time ago. There is too much counter evidence of renewed activities on the part of Chevrolet, Hudson, Oakland-Pontiac, Willys and others.

Reports have it that Ford's Rouge plant is to suspend operations on Dec. 17 until Jan. 5. There is a possibility that this shutdown may be extended until Jan. 12. This plan is said to be due not only to taking of inventories, but also to some changes in product. In the normal course of business it is customary for the people supplying Ford with material to visit departments in the Rouge works, but lately all vendors have been excluded. In the past this prohibition of visitors has been at a time when model changes were being made, so that it is assumed that the order has been issued recently for a similar motive. It is reported that the Ford tool departments have been exceptionally busy recently, a development which further points to some interesting announcements from Dearborn in the near future.

**F**ORD'S purchases of steel the past two months have been light and indicate that December production will be 30,000 cars with some 50,000 scheduled for January. It is said that the company will carry over into January enough steel for 20,000 cars, so that the steel placed with outside sources for that month has been of small volume. The Rouge steel plant has built up a considerable stock of material because of the low rate of operations. One way of working down this tonnage is for Ford to insist upon

Automobile companies are trying to buy steel through first half of 1931 and castings through third quarter at present prices.

\* \* \*

Rouge plant of Ford Motor Co. reported closed from Dec. 17 to Jan. 5.

\* \* \*

Evidence accumulates that Ford will build V-type eight at Highland Park. Price reduction in model A expected first week in January.

\* \* \*

Orders for new Chevrolet have been large, cutting into Ford sales.

companies making Ford parts to use forging billets and bars from Rouge instead of buying them from the steel industry. In many cases it is alleged that the wishes of suppliers are not consulted, Ford arbitrarily notifying them that a certain tonnage of steel will be shipped to them on a certain date.

A recent example of this practice was the receipt of 1000 tons of steel by a Jackson, Mich., company. This concern has been purchasing its steel requirements from several mills, but Ford notified it that it must take a specified tonnage from the Rouge works, so it had no recourse but to make the best of the situation. It is said that Ford sets an arbitrary price of 2c. a lb. for its steel, not varying from this amount even though it may be far wide of the actual commercial market. It is known that Ford has indulged in this practice over a long period and in some instances has shipped its steel by water to Chicago into the very heart of the steel producing area.

**Ford Eight at Highland Park**

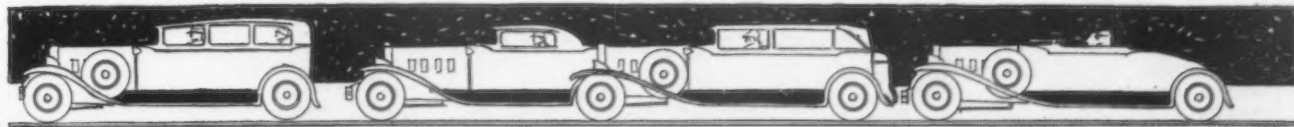
Additional evidence accumulates pointing to the production of an eight-

cylinder Ford at the Highland Park plant. Highland Park is seething with excitement over the prospects of the employment of 25,000 to 35,000 men for this work; and plans sponsored or directly encouraged by Highland Park banks, including one closely affiliated with Ford interests, indicate that Ford has a definite program mapped out for the long-idle Highland Park works. It is considered likely that Ford will make an announcement about an eight-cylinder car about Feb. 1. From quarters usually familiar with what Ford intends to do comes the statement that this announcement "will startle the automobile world." One can readily picture the realignment within the automobile industry which would result from Ford's invasion of the low-priced eight field. It is not an exaggeration to say that Ford's plans for an eight are being watched as closely and with as much interest as his program at the time that model T was discarded in favor of model A.

**H**AVING made a poor showing in the past year, the Willys-Overland Co. is reported to be ready to stage a come-back. Its personnel and financial structure have been reorganized preparatory to waging a campaign to regain lost ground. Its plans are said to call for reduction in the number of models from 32 to 12, elimination of the Whippet and Overland names for its cars, and production of a Willys six and a Willys-Knight six and eight at substantially lower prices. The reduction in the Willys-Knight line probably will be \$700. The company is reported to be hopeful of turning out some 30,000 Willys-Knights in the first six months of 1931.

**Chevrolet Well Received**

Chevrolet is not even pausing for the holiday season this year. Strange as it may seem, some dealers actually are having difficulty in securing cars for which orders have been placed. There is a story that dealers in Detroit have found that the week's pre-





# OBITUARY

HOWARD R. CONNELL, for 22 years representative of the General Electric Co. at the plant of the Allegheny Steel Co., died suddenly at his home at Tarentum, Pa., Dec. 3, aged 48 years. He was a graduate of Syracuse University and became identified with the research laboratory of the General Electric Co. in 1906. Two years later he was put in charge of the company's laboratory at the plant of the Allegheny company at Brackenridge, Pa.

WILLIAM H. LUTZ, formerly president of Lutz Co., manufacturer of machinery and tools, Philadelphia, died at his home in Merion, Pa., on Dec. 11. He was 54 years old.

FRED GRAF, for the past two years with the Milwaukee Foundry Equipment Co., Milwaukee, died in that city on Dec. 4, aged 40 years. He was graduated from Purdue University and had been foundry engineer for a number of companies, including Southern Wheel Co., Frank D. Chase Co., and American Foundry Equipment Co.

COL. WALTER SCRANTON, founder of the Scranton Steel Co. and later president of the Lackawanna Steel Co., died in Pasadena, Cal., Dec. 11, aged 82 years.

ELMER J. MANNING, proprietor of the Manning Machine Works, Janesville, Wis., and widely known mechanical engineer, died from the effects of an operation on Dec. 5, aged 63 years.

EARL E. BOWDEN, district sales manager in Milwaukee for the American Electric Motor Co., died, Dec. 4, after a week's illness. He was 32 years of age, and had been associated with the motor company 11 years.

JAMES T. WHITEHEAD, president, Whitehead & Kales Co., Detroit, died at his home on Dec. 9. Born in Wyandotte, Mich., in 1864, at the age of 15 he got a job with Rathbone, Sard & Co., which was the Detroit branch of an Albany, N. Y., stove company. After being with this firm for nine years, he bought the Detroit Metal & Heating Works, in 1893 selling an interest to Henry B. Lewis and operating the company for four years as Whitehead & Lewis. In 1897 he severed his connection with the company and founded the J. T. Whitehead & Co. Two years later he took in as his partner William R. Kales. Under the firm name of Whitehead & Kales Co. they branched out into the bridge and structural steel lines. In 1916 the company purchased the Detroit Bridge

& Steel Works, acquiring its plant. With Henry Ford, Senator James Couzens and John H. Johnson, Mr. Whitehead organized the Highland Park State Bank of Highland Park, Mich., for a time serving as president and later as chairman of the board, the position he held at the time of his death. Mr. Whitehead was one of the best known steel fabricators in the country and formerly was a member of the board of directors of the American Institute of Steel Construction, Inc. He was active in civic life, having been a member of the Detroit Public Lighting Commission and the City Plan Commission.

CLAUDE M. DIBBLE, vice-president, Moore Brothers' Stove Works, Joliet, Ill., died Dec. 13, aged 40 years. He was a graduate of Yale University.

W. S. INGRAHAM, for the past 38 years general manager of the E. Ingraham Co., Bristol, Conn., died at his home in that city on Dec. 14, aged 73 years.

## Analyzes Scrap Consumption By 10 Steel Companies

To supplement its report issued recently on the total consumption of scrap iron and steel during 1929 by the steel industry of the United States, the research bureau of the Institute of Scrap Iron and Steel has made a composite analysis of the consumption of scrap by 10 steel companies whose plants are located in the principal steel-producing districts of the country. The consumption of scrap by these 10 companies, which have a total annual ingot-producing capacity of 8,841,700 tons, was divided as follows:

	Tons	Tons
Home scrap.....		1,537,846
Purchased from scrap dealers .....	2,366,335	
Purchased direct from producers of scrap..	77,275	
Total purchased scrap.....		2,443,610
Total consumption of scrap .....		3,981,456

Only three of the 10 companies divided their total scrap consumption into grades. The other seven made these classifications only for their purchased scrap. The total scrap consumption of the three companies, whose ingot-producing capacity was 4,842,000 gross tons, was divided according to the following grades:

	Gross Tons
No. 1 heavy melting steel.....	1,050,698
No. 2 heavy melting steel.....	445,000
Compressed sheet steel.....	266,650
Short shoveling turnings.....	79,093
Low phosphorus scrap.....	42,488
All other grades.....	115,660
Total scrap consumption.....	1,999,589

The seven companies which classified only their open market purchases had a total ingot capacity of 3,999,700 tons, and their scrap purchases

were divided according to the following grades:

	Gross Tons
No. 1 heavy melting steel.....	424,383
No. 2 heavy melting steel.....	339,835
Compressed sheet steel.....	136,565
Short shoveling turnings.....	35,000
Machine shop turnings.....	17,459
Low phosphorus scrap.....	60,000
Other grades .....	102,459
Total purchased scrap.....	1,115,701

The scrap institute comments as follows:

"Several conclusions are possible from these figures. One is that direct buying of scrap by the steel mills forms a very small part of the purchases of most of the steel companies, notwithstanding the fact that it is a factor with one or two companies not included in this group.

"Many of the mills are finding it possible to utilize the secondary grades of scrap, generally classified as No. 2 heavy melting steel. Consumption of compressed sheet steel is undoubtedly becoming of greater importance, this being a direct reflection of the increasing consumption of the lighter forms of steel, such as sheets and strip, and this increased consumption results in the production of much light scrap, which is to a growing extent being baled in hydraulic presses for remelting by the steel mills. The survey of scrap production by the automobile industry, which is a large producer of compressed sheet steel, the results of which were announced recently by the Institute of Scrap Iron and Steel, revealed that of a total scrap output of approximately 1,000,000 tons last year at least 235,279 tons was in the form of compressed sheet steel."

## Mining Meeting to Be Held at Seattle

The College of Mines, University of Washington, Seattle, Wash., announces that its third annual mining institute will take place Jan. 19 to 25, 1931. The sessions will be held in mines laboratory and are open to all persons interested in any phase of the mining, metallurgical, or ceramic industries. No fees are charged for entrance. Last year 240 persons attended the various meetings. The schedule of lectures, laboratory exercises, field trips and demonstrations occupies the full week. Fuller details of the program will be announced later. In the meantime, tentative announcement is made that speakers from the mining industry will discuss safety in mining, development of local manganese deposits, utilization of non-metallics, etc. Members of the faculty of the College of Mines will, as usual, give lectures covering their special fields of activity.

Inland Steel Co., Chicago, announces that starting in January it will roll 6-in. H-beams ranging 20 to 27½ lb. per ft. in weight and also 12-in. light-weight I-beams with a weight of 25 lb. per ft.

## Fabricated Steel Orders and Shipments Declining

WASHINGTON, D. C., Dec. 16.—Weekly shipments of fabricated structural steel have been at a fairly steady rate, though the trend has been slightly downward, during the fourth quarter of this year, according to the tabulations of the Bureau of the Census, Department of Commerce, which has been compiling the figures on a weekly basis since the week ended Sept. 6.

As the number of reporting concerns varies from week to week, their actual figures for bookings and shipments are not comparable without adjustments. The figures on adjusted shipments for the period up to Nov. 22 show relatively slight variations. For the weeks ended with the dates given, adjusted shipments have been as follows:

Tons		Tons	
Sept. 6.....	29,450	Oct. 18.....	28,683
Sept. 13.....	35,851	Oct. 25.....	27,497
Sept. 20.....	36,434	Nov. 1.....	29,590
Sept. 27.....	32,902	Nov. 8.....	23,279
Oct. 4.....	29,704	Nov. 15.....	25,812
Oct. 11.....	32,075	Nov. 22.....	29,494

Bookings on an adjusted basis have fluctuated rather more widely than shipments, with the trend generally downward in October and November, compared with September. In the week ended Nov. 22 bookings reported were 18,798 tons, or 41.4 per cent of the capacity of 45,398 tons represented by the 108 reporting establishments. In the previous week, orders reported by 111 establishments were 31,222 tons, or 68 per cent of their capacity of 45,940 tons. Adjusted bookings

were 26,325 tons, or 49.2 per cent of capacity, in the week ended Nov. 22, against 43,197 tons, or 49.8 per cent of capacity, in the previous week.

Making a gain of 53,600 tons, orders for fabricated structural steel in October totaled 215,600 tons, or 53.9 per cent of the estimated capacity of 400,000 tons for all plants in the United States, against 162,000 tons, or 40.5 per cent of capacity, in September, according to reports received by the Bureau of the Census from fabricators. Shipments in October were 253,600 tons, or 63.4 per cent of capacity, against 258,400 tons, or 64.6 per cent of capacity, in September.

## Armco Distributors Hold Annual Meeting

The Armco Distributors Association of America, at its annual meeting at Middletown, Ohio, on Dec. 3 and 4 reelected Quincy W. Wales of the Brown-Wales Co., Boston, president. A. J. Ludke, Milcor Steel Co., Milwaukee, was elected vice-president and George O. M. Johnston of the McClure-Johnston Co., Pittsburgh, secretary-treasurer. George M. Verity, chairman of the board of directors of the American Rolling Mill Co., addressed the meeting, also Charles R. Hook, president, American Rolling Mill Co.; G. F. Ahlbrandt, general manager of sales; D. M. Strickland, manager of the development department of the sales division, and Bennett Chapple, vice-president in charge of advertising.

## Prices for Non-Ferrous Ingots

CHICAGO, Dec. 12.—The Non-Ferrous Ingot Metal Institute reports the average prices per pound received by its membership on commercial grades of six principal mixtures of ingot brass during the 28-day period ended Dec. 5. These statistics will have to be gathered and reported on the basis of "commercial grades" until the revised specifications for copper base alloys in ingot form for sand castings, adopted as tentative specifications by the American Society for Testing Materials during the summer of 1930, are in sufficiently general use to enable the gathering of statistics on a strict specification basis.

	Cents
Commercial 80-10-10 (1 per cent impurities).....	11.565
Commercial 78 per cent metal.....	10.021
Commercial 81 per cent metal.....	9.979
Commercial 83 per cent metal.....	10.151
Commercial 85-5-5-5.....	10.659
Commercial No. 1 yellow brass ingot.....	8.233

## 130,000 Tons of Scrap in 45 Ships to Be Sold

WASHINGTON, Dec. 16.—The Shipping Board has accepted the bid of \$384,960 made by the Union Shipbuilding Co. for 45 steel cargo steamers aggregating 357,560 dead-weight tons. All of the vessels are to be completely dismantled and scrapped within two years. Twenty-two of them are at Norfolk, Va., 16 at New York and seven at Philadelphia. It is estimated that approximately 130,000 gross tons of steel scrap will be recovered from the 45 ships.

## Shop System in 1873

WHAT bookkeeping is to general business, system is to any branch of manufacture and by this is meant not merely the orderly coming and going of workmen at the sound of the whistle, nor even the literal and well defined use of having a place for everything and everything in its place. Every shop must have its own particular methods gaged according to its size, the character of its products, the relative skill of its operators, and many other conditions peculiar to itself. It is a practice and a paying one in many large machine works to have the tools, files, drills, vise heads, chisels, etc., kept in a separate room under the charge of a special clerk and each implement carefully charged to the workman using it. On the other hand, there are thousands of small work shops where one, two or three mechanics make a fair livelihood by ten hours of industrious labor per day, in which the truest economy is found

in each man's ability to make and repair his own tools without assistance from his associates. What is necessary system in the one case would be absurdity in the other.

One of the most common sources of inconvenience and consequently in time of material loss, is found in the bad arrangement of different parts of a shop with reference to each other and in the cumbered condition of the floors.

But while method and system should ever be observed in fitting up a work shop, whatever the industry to be carried on within it, intelligence and judgment should guide the manufacturer in planning its construction. He should consider carefully the best methods of combining strength with economy of material, select that material which other things being equal costs the least, and work up so far as possible the refuse to some good purpose. This sounds of course like the simplest commonplace, but at

least five out of ten miscellaneous workshops disregard these common sense rules habitually.

Perhaps the item in which method brings the largest returns is that of keeping machinery in constant use. Not only by this means is its usual profit obtained and the interest on its first cost saved, but the mechanism if kept in good repair will last much longer, for it is well known that when it is in daily operation a machine like an engine lathe will deteriorate but one-half as fast as when entirely idle. This should be kept in mind when selecting for manufacture a line of staple articles; that which will keep the machinery running regular throughout the year, other things being equal, pays a better interest on time, money and labor, than that which for any cause must be allowed to stand idle at intervals.

Extract from *The Iron Age*,  
Aug. 28, 1873.



showing prior to the national announcement was somewhat of a boomerang. They took orders for fairly prompt delivery of cars, but have been busy ever since trying to placate buyers who have been waiting a month for them to fulfill their prompt delivery promises. Chevrolet officials are much pleased with the reception of the 1931 models, feeling that the large volume of orders placed in the last 30 days augurs well for the months just ahead.

**T**HAT the automobile industry is of the opinion that the lowest point in the depression has been reached is indicated by the efforts of individual companies to get an extension of present prices for materials as far ahead as possible. One large company is trying to contract for its castings through the third quarter of 1931 at the current level; as the castings people are hungry for business, it would not be surprising if it got this protection. Other manufacturers are seeking contracts on bars and sheets through the first half, but so far have been unsuccessful. One of the largest low-priced car makers sought more than 60 days ago to make a contract at the then prevailing schedule for its entire 1931 supply of by-product coke. However, it found no bidders on that basis.

#### Cannot Secure Deliveries

There is such a thing as reducing stocks to a point where deliveries cannot be obtained on short notice. Suppliers as well as automobile companies cannot keep running without orders. They in turn must adopt measures of economy in order to maintain their position. The recent experience of an automobile engine builder is fairly typical. In order to conform to a program of one of its customers, it was necessary to secure engine parts quickly. It soon found that this was not only difficult, but in a number of cases impossible. The parts makers had allowed their raw materials to dwindle and had cut their

forces substantially. To get the machinery into action again could not be done overnight. The result is that the engine builder must wait for its parts. With the present low state of industrial operations, the almost total absence of raw materials and finished stocks from metal-working plants and the depletion of working forces, one might easily conjure delayed deliveries and a congested condition in case a sudden flurry of business descended.

**A**UTOMOBILE companies have done much to alleviate distress in recent weeks. In addition to contributing substantially to community funds, they have privately initiated measures to help their own employees. Studebaker at South Bend is reported to have set aside an entire floor in one of its buildings as a general commissary for its people, whether they are working now or not. There they

can obtain food practically at cost. If they are not able to pay for it, they are just as welcome, the company stating that they can pay for it some time later. Both the Oakland Motor Car Co. and the Wilson Foundry & Machine Co. at Pontiac have helped tide many employees over the present emergency. The Fisher Brothers have just offered to the city of Detroit sleeping quarters for 2500 homeless men in the Fisher body plant at Fort and Twenty-third Streets. The Fishers will donate the use of the building and will heat and light it and provide sanitary facilities at their own expense. Supervision of the dormitory will be in the hands of the Salvation Army, which will provide a hot breakfast to the lodgers daily. The city will purchase 2500 cots with necessary bedding at once. If the need arises, the building will accommodate 10,000 men.

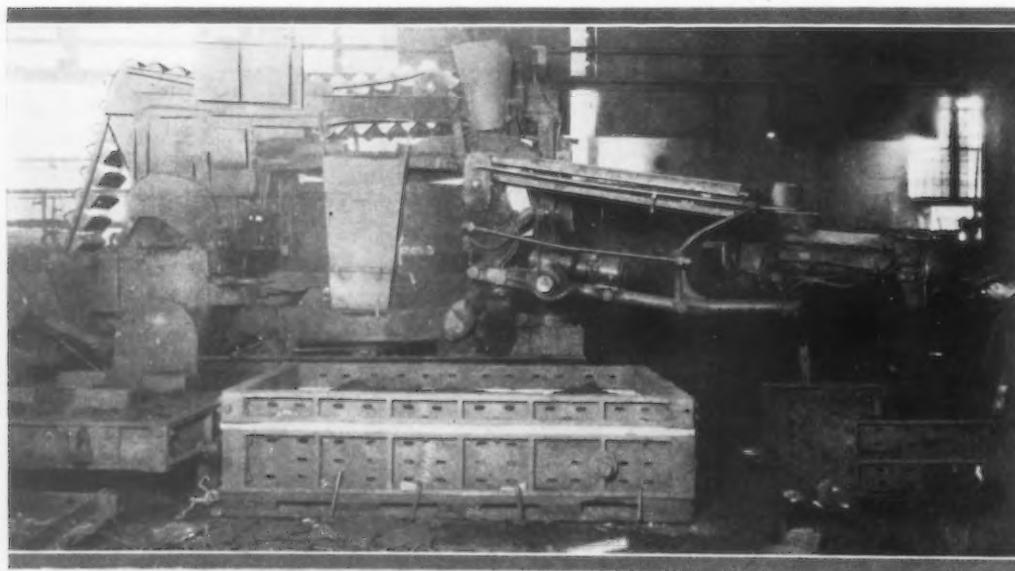
#### Martin, New Midget Car, Under Production

WASHINGTON, Dec. 16.—Production on the Martin midget car has begun at the plant of the Moller Motor Car Co., Hagerstown, Md., manufacturing agent for Martin Motors, Inc., Washington, according to J. W. Bryan, president. Mr. Bryan said that immediate output calls for 3000 demonstration cars to be put at strategic points in the United States, Canada, Mexico and Cuba. The car on which production has been begun, it was stated, is known as model B, with water thermo-syphon, a Redseal Continental 29½-hp. engine. It is said the car will have a speed of 70 miles per hr. The first car, it was said, will be brought out about Jan. 20. It has a 70-in. wheelbase, 47-in. shoulder room, and weighs 750-lb. The body will be of steel. The price at Hagerstown will be \$250. It is represented

as being exceedingly economical in fuel and tire use.

Mr. Bryan said that orders have been received for more than 50,000 cars, including all models, and that dealer agencies are being established. Production on Model A, according to Mr. Bryan, will be started in a few months. It was stated it will have an air-cooled engine, weigh 600 lb., and sell for \$200, f.o.b. Hagerstown. The body design of the Martin is by C. W. Adler, former chief body designer of the Brewster-Rolls-Royce Co., and the chief engineer is M. H. Carpenter, designer and former builder of the Phinea, a high-priced foreign car.

Mystic Iron Works, Everett, Mass., states that the published report that it has contracted for 200,000 tons of iron ore from Almeria, Spain, is incorrect.



**L**OCATED in the main foundry at the Trafford, Pa., works of the Westinghouse Electric & Mfg. Co., this sand slinger travels along a 300-ft. track, picking up sand, straining it, and depositing and ramming it into the molds at the right. The head swings on a radius of 15 ft. to fill and ram molds for motor frames, pedestals, bedplates, and other large apparatus

# PERSONALS

C. R. MESSINGER, president, Chain Belt Co., Milwaukee, is to become associated in an executive capacity with the Oliver Farm Equipment Co.

WALTER F. GRAHAM, at one time chief metallurgist of the American Mond Nickel Co., has been appointed technical director of the Caskey Brass & Bronze Works, Inc., Philadelphia, agent of the International Nickel Co. and manufacturer of nickel and nickel alloy and non-ferrous castings.

LEE E. ALLEN, chief engineer and secretary of the Pennsylvania Engineering Works, New Castle, Pa., has been elected president of the Engineers' Society of New Castle.

S. H. TAYLOR, JR., has been placed in charge of the Pacific Coast offices, with headquarters at 812 Mateo Street, Los Angeles, Cal., for the Lincoln Electric Co., Cleveland. L. P. HENDERSON has been made manager of the San Francisco office, and E. J. PFISTER, formerly of the Philadelphia and Allentown, Pa., offices, has become district manager of the Kansas City district, with offices at 405 R. A. Long Building.

A. M. CANDY, arc welding engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, was scheduled to address the Springfield, Mass., chapter of the American Society for Steel Treating, Dec. 15, on "Structural Steel Welding with Special Reference to Welding in Machinery Manufacture." R. F. HARRINGTON, metallurgist, Hunt-Spiller Mfg. Corp., Boston, will address the Worcester, Mass., chapter of the Society, Dec. 18, on "Cast Iron in the Light of Modern Research." E. S. DAVENPORT, research engineer for the United States Steel Corp., is scheduled to talk on "Some New Aspects of the Hardening of Steel" at a meeting of the New Haven, Conn., chapter on Dec. 18.

DEAN CLARK, who has had a considerable experience in management administration and operation, has established himself as consulting engineer at 535 Fifth Avenue, New York.

E. P. OGDEN and F. G. GIBSON sailed for Russia on Dec. 16 to join the organization of engineers of Freyn Engineering Co.

R. G. OLSON, manager, Milwaukee branch, American Blower Co., has been promoted to have charge of the Cleveland branch.

ROBERT S. ARCHER, who has been metallurgist in the research department of the Aluminum Co. of America at Cleveland since 1920, and whose work in aluminum and aluminum alloys is internationally known, has resigned to become head of the metallurgical research staff of the A. O. Smith Corp., Milwaukee. He took charge of his new work on Dec. 1, and will direct the activities of



R. S. Archer

about 100 men. Mr. Archer obtained the degree of Bachelor of Chemical Engineering in 1916 at the University of Michigan, receiving in the following year the degree of Master of Science. He has been active for many years in the affairs of the Cleveland chapter of the American Society for Steel Treating and has played an important part in the national activities of the society.

M. L. JACOB, recently in charge of the industrial engineering department of Charles Hecht & Co., New York, has become associated with Aires, Stone & Pettay, 335 Boulevard of the Allies, Pittsburgh, engineers, and his name has been added to that of the firm.

A. W. BASS, who has been assistant to the vice-president of the Westinghouse Electric & Mfg. Co., East Pittsburgh, directing works records and statistics and also works accounting for the company and its subsidiaries, has been appointed director of budgets for the company. Time study and works supervisory bonus activities formerly in charge of Mr. Bass will

hereafter be under the direction of A. TAYLOR, assistant to the vice-president, who will continue his previous duties.

FRANK W. CURTIS, research engineer, Kearney & Trecker Corp., Milwaukee, addressed the monthly meeting of the Engineers Society of Milwaukee, Dec. 17, on recent development and application of tungsten carbide in metal-cutting operations. The talk was illustrated with stereopticon slides and motion pictures taken in the plant of the Kearney & Trecker Corp.

S. W. PARSONS, president and general manager, Skinner Chuck Co., New Britain, Conn., has returned to the Stanley Works, Inc., with which he was associated for many years. Mr. Parsons will remain a member of the Skinner Chuck Co. board of directors. ARTHUR E. THORNTON, assistant secretary, Skinner Chuck Co., has been made factory manager.

FRANCIS H. RICHARDS, for many years consulting engineer with the Pratt & Whitney Co., Hartford, Conn., and the Stanley Rule & Level Co., New Britain, was presented a gold medal by Calvin W. Rice and Maxwell C. Maxwell on behalf of the American Society of Mechanical Engineers on Dec. 10, at Hotel Davenport, Stamford, Conn. The presentation was in recognition of Mr. Richards's accomplishments as an inventor and of his 50 years of membership in the society, of which he was one of the founders. He is 80 years old.

CUMMINGS C. CHESNEY, for many years prominently identified with the General Electric Co., has returned from a three months' trip abroad.

JOHN H. MORRISON, vice-president, Warren Foundry & Pipe Corp., and vice-president and general sales manager of the Warren Foundry & Pipe Co., sailed Dec. 13 for a seven weeks' business and pleasure trip in the British Isles and on the Continent. Mr. Morrison has been associated with the cast iron pipe industry for 23 years.

The American Monorail Co., Cleveland, furnished the monorail, cranes and trolleys installed in the plant of the Lebanon Steel Foundry, Lebanon, Pa., described at length in THE IRON AGE of Dec. 4, and the device for raising and lowering the ladles was supplied by the Modern Pouring Device Co., Port Washington, Wis.



# OBITUARY

HOWARD R. CONNELL, for 22 years representative of the General Electric Co. at the plant of the Allegheny Steel Co., died suddenly at his home at Tarentum, Pa., Dec. 3, aged 48 years. He was a graduate of Syracuse University and became identified with the research laboratory of the General Electric Co. in 1906. Two years later he was put in charge of the company's laboratory at the plant of the Allegheny company at Brackenridge, Pa.

WILLIAM H. LUTZ, formerly president of Lutz Co., manufacturer of machinery and tools, Philadelphia, died at his home in Merion, Pa., on Dec. 11. He was 54 years old.

FRED GRAF, for the past two years with the Milwaukee Foundry Equipment Co., Milwaukee, died in that city on Dec. 4, aged 40 years. He was graduated from Purdue University and had been foundry engineer for a number of companies, including Southern Wheel Co., Frank D. Chase Co., and American Foundry Equipment Co.

COL. WALTER SCRANTON, founder of the Scranton Steel Co. and later president of the Lackawanna Steel Co., died in Pasadena, Cal., Dec. 11, aged 82 years.

ELMER J. MANNING, proprietor of the Manning Machine Works, Janesville, Wis., and widely known mechanical engineer, died from the effects of an operation on Dec. 5, aged 63 years.

EARL E. BOWDEN, district sales manager in Milwaukee for the American Electric Motor Co., died, Dec. 4, after a week's illness. He was 32 years of age, and had been associated with the motor company 11 years.

JAMES T. WHITEHEAD, president, Whitehead & Kales Co., Detroit, died at his home on Dec. 9. Born in Wyandotte, Mich., in 1864, at the age of 15 he got a job with Rathbone, Sard & Co., which was the Detroit branch of an Albany, N. Y., stove company. After being with this firm for nine years, he bought the Detroit Metal & Heating Works, in 1893 selling an interest to Henry B. Lewis and operating the company for four years as Whitehead & Lewis. In 1897 he severed his connection with the company and founded the J. T. Whitehead & Co. Two years later he took in as his partner William R. Kales. Under the firm name of Whitehead & Kales Co. they branched out into the bridge and structural steel lines. In 1916 the company purchased the Detroit Bridge

& Steel Works, acquiring its plant. With Henry Ford, Senator James Couzens and John H. Johnson, Mr. Whitehead organized the Highland Park State Bank of Highland Park, Mich., for a time serving as president and later as chairman of the board, the position he held at the time of his death. Mr. Whitehead was one of the best known steel fabricators in the country and formerly was a member of the board of directors of the American Institute of Steel Construction, Inc. He was active in civic life, having been a member of the Detroit Public Lighting Commission and the City Plan Commission.

CLAUDE M. DIBBLE, vice-president, Moore Brothers' Stove Works, Joliet, Ill., died Dec. 13, aged 40 years. He was a graduate of Yale University.

W. S. INGRAHAM, for the past 38 years general manager of the E. Ingraham Co., Bristol, Conn., died at his home in that city on Dec. 14, aged 73 years.

## Analyzes Scrap Consumption By 10 Steel Companies

To supplement its report issued recently on the total consumption of scrap iron and steel during 1929 by the steel industry of the United States, the research bureau of the Institute of Scrap Iron and Steel has made a composite analysis of the consumption of scrap by 10 steel companies whose plants are located in the principal steel-producing districts of the country. The consumption of scrap by these 10 companies, which have a total annual ingot-producing capacity of 8,841,700 tons, was divided as follows:

	Tons	Tons
Home scrap.....		1,537,846
Purchased from scrap dealers .....	2,366,335	
Purchased direct from producers of scrap..	77,275	
Total purchased scrap.....		2,443,610
Total consumption of scrap .....		3,981,456

Only three of the 10 companies divided their total scrap consumption into grades. The other seven made these classifications only for their purchased scrap. The total scrap consumption of the three companies, whose ingot-producing capacity was 4,842,000 gross tons, was divided according to the following grades:

	Gross Tons
No. 1 heavy melting steel.....	1,050,698
No. 2 heavy melting steel.....	445,000
Compressed sheet steel.....	266,650
Short shoveling turnings.....	79,093
Low phosphorus scrap.....	42,488
All other grades.....	115,660
Total scrap consumption.....	1,999,589

The seven companies which classified only their open market purchases had a total ingot capacity of 3,999,700 tons, and their scrap purchases

were divided according to the following grades:

	Gross Tons
No. 1 heavy melting steel.....	424,383
No. 2 heavy melting steel.....	339,835
Compressed sheet steel.....	136,565
Short shoveling turnings.....	35,000
Machine shop turnings.....	17,459
Low phosphorus scrap.....	60,000
Other grades .....	102,459
Total purchased scrap.....	1,115,701

The scrap institute comments as follows:

"Several conclusions are possible from these figures. One is that direct buying of scrap by the steel mills forms a very small part of the purchases of most of the steel companies, notwithstanding the fact that it is a factor with one or two companies not included in this group.

"Many of the mills are finding it possible to utilize the secondary grades of scrap, generally classified as No. 2 heavy melting steel. Consumption of compressed sheet steel is undoubtedly becoming of greater importance, this being a direct reflection of the increasing consumption of the lighter forms of steel, such as sheets and strip, and this increased consumption results in the production of much light scrap, which is to a growing extent being baled in hydraulic presses for remelting by the steel mills. The survey of scrap production by the automobile industry, which is a large producer of compressed sheet steel, the results of which were announced recently by the Institute of Scrap Iron and Steel, revealed that of a total scrap output of approximately 1,000,000 tons last year at least 235,279 tons was in the form of compressed sheet steel."

## Mining Meeting to Be Held at Seattle

The College of Mines, University of Washington, Seattle, Wash., announces that its third annual mining institute will take place Jan. 19 to 25, 1931. The sessions will be held in mines laboratory and are open to all persons interested in any phase of the mining, metallurgical, or ceramic industries. No fees are charged for entrance. Last year 240 persons attended the various meetings. The schedule of lectures, laboratory exercises, field trips and demonstrations occupies the full week. Fuller details of the program will be announced later. In the meantime, tentative announcement is made that speakers from the mining industry will discuss safety in mining, development of local manganese deposits, utilization of non-metallics, etc. Members of the faculty of the College of Mines will, as usual, give lectures covering their special fields of activity.

Inland Steel Co., Chicago, announces that starting in January it will roll 6-in. H-beams ranging 20 to 27½ lb. per ft. in weight and also 12-in. light-weight I-beams with a weight of 25 lb. per ft.

## Fabricated Steel Orders and Shipments Declining

WASHINGTON, D. C., Dec. 16.—Weekly shipments of fabricated structural steel have been at a fairly steady rate, though the trend has been slightly downward, during the fourth quarter of this year, according to the tabulations of the Bureau of the Census, Department of Commerce, which has been compiling the figures on a weekly basis since the week ended Sept. 6.

As the number of reporting concerns varies from week to week, their actual figures for bookings and shipments are not comparable without adjustments. The figures on adjusted shipments for the period up to Nov. 22 show relatively slight variations. For the weeks ended with the dates given, adjusted shipments have been as follows:

	Tons		Tons
Sept. 6.....	29,450	Oct. 18.....	28,683
Sept. 13.....	35,851	Oct. 25.....	27,497
Sept. 20.....	36,434	Nov. 1.....	29,590
Sept. 27.....	32,962	Nov. 8.....	23,279
Oct. 4.....	29,704	Nov. 15.....	25,812
Oct. 11.....	32,075	Nov. 22.....	29,494

Bookings on an adjusted basis have fluctuated rather more widely than shipments, with the trend generally downward in October and November, compared with September. In the week ended Nov. 22 bookings reported were 18,798 tons, or 41.4 per cent of the capacity of 45,398 tons represented by the 108 reporting establishments. In the previous week, orders reported by 111 establishments were 31,222 tons, or 68 per cent of their capacity of 45,940 tons. Adjusted bookings

were 26,325 tons, or 49.2 per cent of capacity, in the week ended Nov. 22, against 43,197 tons, or 49.8 per cent of capacity, in the previous week.

Making a gain of 53,600 tons, orders for fabricated structural steel in October totaled 215,600 tons, or 53.9 per cent of the estimated capacity of 400,000 tons for all plants in the United States, against 162,000 tons, or 40.5 per cent of capacity, in September, according to reports received by the Bureau of the Census from fabricators. Shipments in October were 253,600 tons, or 63.4 per cent of capacity, against 258,400 tons, or 64.6 per cent of capacity, in September.

## Armco Distributers Hold Annual Meeting

The Armco Distributers Association of America, at its annual meeting at Middletown, Ohio, on Dec. 3 and 4 reelected Quincy W. Wales of the Brown-Wales Co., Boston, president. A. J. Ludke, Milcor Steel Co., Milwaukee, was elected vice-president and George O. M. Johnston of the McClure-Johnston Co., Pittsburgh, secretary-treasurer. George M. Verity, chairman of the board of directors of the American Rolling Mill Co., addressed the meeting, also Charles R. Hook, president, American Rolling Mill Co.; G. F. Ahlbrandt, general manager of sales; D. M. Strickland, manager of the development department of the sales division, and Bennett Chapple, vice-president in charge of advertising.

## Prices for Non-Ferrous Ingots

CHICAGO, Dec. 12.—The Non-Ferrous Ingot Metal Institute reports the average prices per pound received by its membership on commercial grades of six principal mixtures of ingot brass during the 28-day period ended Dec. 5. These statistics will have to be gathered and reported on the basis of "commercial grades" until the revised specifications for copper base alloys in ingot form for sand castings, adopted as tentative specifications by the American Society for Testing Materials during the summer of 1930, are in sufficiently general use to enable the gathering of statistics on a strict specification basis.

	Cents
Commercial 80-10-10 (1 per cent impurities) .....	11.565
Commercial 78 per cent metal....	10.021
Commercial 81 per cent metal....	9.979
Commercial 83 per cent metal....	10.151
Commercial 85-5-5-5.....	10.659
Commercial No. 1 yellow brass ingot .....	8.233

## 130,000 Tons of Scrap in 45 Ships to Be Sold

WASHINGTON, Dec. 16.—The Shipping Board has accepted the bid of \$384,960 made by the Union Shipbuilding Co. for 45 steel cargo steamers aggregating 357,560 dead-weight tons. All of the vessels are to be completely dismantled and scrapped within two years. Twenty-two of them are at Norfolk, Va., 16 at New York and seven at Philadelphia. It is estimated that approximately 130,000 gross tons of steel scrap will be recovered from the 45 ships.

## Shop System in 1873

WHAT bookkeeping is to general business, system is to any branch of manufacture and by this is meant not merely the orderly coming and going of workmen at the sound of the whistle, nor even the literal and well defined use of having a place for everything and everything in its place. Every shop must have its own particular methods gaged according to its size, the character of its products, the relative skill of its operators, and many other conditions peculiar to itself. It is a practice and a paying one in many large machine works to have the tools, files, drills, vise heads, chisels, etc., kept in a separate room under the charge of a special clerk and each implement carefully charged to the workman using it. On the other hand, there are thousands of small work shops where one, two or three mechanics make a fair livelihood by ten hours of industrious labor per day, in which the truest economy is found

in each man's ability to make and repair his own tools without assistance from his associates. What is necessary system in the one case would be absurdity in the other.

One of the most common sources of inconvenience and consequently in time of material loss, is found in the bad arrangement of different parts of a shop with reference to each other and in the cumbered condition of the floors.

But while method and system should ever be observed in fitting up a work shop, whatever the industry to be carried on within it, intelligence and judgment should guide the manufacturer in planning its construction. He should consider carefully the best methods of combining strength with economy of material, select that material which other things being equal costs the least, and work up so far as possible the refuse to some good purpose. This sounds of course like the simplest commonplace, but at

least five out of ten miscellaneous workshops disregard these common sense rules habitually.

Perhaps the item in which method brings the largest returns is that of keeping machinery in constant use. Not only by this means is its usual profit obtained and the interest on its first cost saved, but the mechanism if kept in good repair will last much longer, for it is well known that when it is in daily operation a machine like an engine lathe will deteriorate but one-half as fast as when entirely idle. This should be kept in mind when selecting for manufacture a line of staple articles; that which will keep the machinery running regular throughout the year, other things being equal, pays a better interest on time, money and labor, than that which for any cause must be allowed to stand idle at intervals.

Extract from *The Iron Age*,  
Aug. 28, 1873.



## Machine Tool Index At Low Point

Orders the Lowest  
Since 1924—December  
Bringing No Improvement

WITH the machine tool index for November at the lowest point since 1924, according to the National Machine Tool Builders' Association, and with no improvement expected this month, the attention of the trade is centered on the possibility of at least a slight upturn in January.

Prospects are numerous, but manufacturers are not ready to buy new equipment until the business situation shows definite signs of clearing.

November orders, as charted by the tool builders' organization, are repre-

sented by the figure 60.4, compared with 90.1 for October and 135.9 for September. The high point of the year was January, at 182. The figure 100 equals the average shipments of 1922, 1923 and 1924.

The three months' moving average of orders stood at the end of November at 95.5, compared with 113.3 the month previous and with 113.6 the month before that. The lowest three months' average of 1924 was 69.4, which occurred in August. The December index would have to fall be-

low 60 to bring the current three months' average down to the level of the 1924 low point.

Shipments in November, at 67, were the lowest since the association began compiling such records, which was in October, 1925. On account of the low volume of shipments, the amount of unfilled orders remained comparatively high, at 229.9, which is a little less than one month's capacity.

Weekly reports from leading centers reveal no significant change in the situation.

### New York

While it does not appear that a change of fundamental importance has occurred in the machine tool market, the local trade has been encouraged by an increase in orders and inquiries. Under normal conditions, the amount of business booked and in prospect would not be considered as worth noting, but compared with the dullness that has prevailed for many weeks the change for the better in the past week was noticeable.

A good many active prospects are being worked on, and, while prospective buyers seem to be in no hurry to place orders, the trade derives some hope from the belief that manufacturers generally will take steps to install new machinery that will reduce production costs as soon as a turn in the business situation has come. The machine tool trade looks for a slow improvement during the first quarter of 1931.

### Pittsburgh

Business so far this month is averaging about the same as in November with most dealers and continues quiet. A few orders are being placed to prevent appropriation money from reverting back to the treasury on the year-end, but this is not running into much volume. Inquiry continues fairly good, although a great part of it is not active and tools mentioned may not even be placed next year.

The Norfolk & Western has not closed on much of the equipment for which it inquired recently, and a large part of these orders will be deferred until next year. No other sizable

railroad inquiry has come out, but dealers are hopeful that some business of this sort will appear in the near future. The Westinghouse Electric & Mfg. Co. has been placing some tools for its smaller plants, but has done little buying for East Pittsburgh recently.

### New England

The new machine tool market continues to mark time. Local dealers are busy making quotations to users for inventory purposes, and occasionally to a prospective buyer. It is the general opinion, however, that business will begin to pick up soon after Jan. 1. Used tool sales are few, but forced sales of equipment are keeping trade interest very much alive. Machinery of Morganmade, Inc., Keene, N. H., maker of aircraft and automotive equipment, was sold at auction the first of the week.

### Chicago

Inquiries are scarce and most of the old requests for prices have been set ahead to the new year. One railroad has a buying program that is well developed, but it will not be opened to the trade before 1931. A Chicago buyer wants two lathes, a 5-ft. radial drill and a planer, but has definitely put off the time of purchase until after Jan. 1. Plans for a new machine shop may not develop before February.

Several users are showing interest in presses, one of 800 tons capacity. However, offerings are light and buyers' specifications appear to be too severe to assure early transactions.

### Milwaukee

New business is light in volume, but inquiry is moderately active. Production is proceeding at a rate comparable to the October-November average. Most shops intend to interrupt working schedules only over the week-ends of the two holidays, while others may close Dec. 24 not to reopen until Jan. 5. Recent improvement in orders from automotive industries has not been sustained, although a fair amount of replacement business comes to light each day. Other industries are inclined to postpone all but the most urgent purchases until the new year.

### Cleveland

Machine tool sales the past week were light and confined to single scattering orders. Quite a little business in single tools is in prospect, but there is a general disposition to defer purchases until January. A rubber company in Akron is figuring on the purchase of two boring mills. Several machine tools will be required for the new Shaker Heights high school, Cleveland, a list of which is expected shortly.

### Cincinnati

Orders the past week consisted of single tools, but in sufficient volume to sustain operations at the present rate. Inquiry, however, has improved and, following the inventory period, it is expected that users will start purchasing equipment. No sudden up-trend in demand is looked for, but rather a slow steady improvement.

## New York

**P**LANS are being considered by Linde Air Products Co., 30 East Forty-second Street, New York, manufacturer of industrial oxygen, welding equipment, etc., for new plant at El Paso, Tex., to cost close to \$100,000 with equipment. Company engineering department will be in charge.

Charles Schaefer, Jr., 332 East 149th Street, New York, architect, has plans for a seven-story automobile service, repair and garage building, 80 x 102 ft., to cost over \$200,000 including equipment.

Port of New York Authority, 75 West Street, New York, has plans for a fifteen-story storage and distributing terminal on block bounded by Eighth and Ninth Avenues, Fifteenth and Sixteenth Streets, to cost over \$10,000,000, including equipment. Engineering department is in charge.

Rudolph E. Rowland, 58 South Seventeenth Street, Flushing, L. I., and associates have organized Rowland's Machine Shop, and plan operation of local machine and repair shop; company will also specialize in manufacture of machinery. Otto Kujath, 111 131st Street, South Ozone Park, L. I., is interested in new company.

James J. Millman, Inc., 67 Court Street, Brooklyn, architect, will soon begin work on multi-story automobile service, repair and garage building, to cost close to \$100,000 including equipment.

Board of Education, Mamaroneck, N. Y., plans installation of manual training equipment in new three-story junior high school to cost about \$850,000, for which foundations will soon begin.

General contract has been let to Acampora Brothers, Inc., 14 Spencer Place. Knappe & Morris, 171 Madison Avenue, New York, are architects.

Consolidated Telephone & Electric Subway Co., foot of 140th Street and Harlem River, New York, has filed plans for one-story mechanical shop, 32 x 108 ft., to cost about \$25,000 with equipment.

B. F. Goodrich Co., Akron, Ohio, manufacturer of tires, tubes and other rubber goods, contemplates a two-story factory branch, storage and distributing plant at Albany, N. Y., to be operated in name of Goodrich Silvertown, Inc., to cost about \$125,000 with equipment.

Board of Education, Union Free School District No. 4, Rye, N. Y., plans installation of manual training department in new multi-story senior high school to cost \$1,350,000, for which superstructure will soon begin.

Anheuser-Busch, Inc., 721 Pestlozzi Street, St. Louis, manufacturer of beverages, etc., has taken title to about 19 acres in East Brunswick Township, near Old Bridge, N. J., as site for new plant for production of yeast, with boiler plant, machine shop and other units, to cost over \$1,500,000 with equipment. It is scheduled to be ready for service early in spring.

Board of Education, Westwood, N. J., plans installation of manual training equipment in new senior high school, to cost over \$400,000, for which plans will be drawn by Arthur E. Dore, State Bank & Trust Building, Hackensack, N. J.

County Gas Co., 58 First Avenue, Atlantic Highlands, N. J., has asked bids on general contract for a two-story equipment and service building, to cost about \$40,000 with equipment.

Fischer & Dackerman, 1153 Chestnut Street, Elizabeth, N. J., manufacturer of automobile bodies, has awarded general contract to Wilhelm Construction Co., 119 Division Street, for one-story addition, including improvements in present plant, to cost close to \$30,000. William L. Finne, 1201 East Grand Street, is architect.

George C. Bergen, County purchasing agent, Hall of Records, Newark, will receive bids until Dec. 23 for floor plates, wall brackets, valves, bolts and shields, etc., for County hospital at Overbrook, Cedar Grove.

## Buffalo

**C**ONTRACT has been let by Syracuse Lighting Co., South Warren Street, Syracuse, N. Y., to J. D. Taylor Construction Co., 115 South Salina Street, for automobile service, repair and garage building for company trucks and cars, to cost about \$100,000 with equipment.

New York Central Railroad Co., Central Terminal, Buffalo, will have plans drawn for a new market terminal at Chicago, Perry and Scott Streets, to cost about \$1,200,000 with equipment.

William Robinson, 125 North Street, Buffalo, and associates have organized Fuel Conditioner Mfg. Corp., with capital of \$50,000 and 1000 shares of common stock, no par value, to operate local plant for manufacture of fuel economizers and conditioning apparatus. Harris A. Brittin, Williamsville, N. Y., is one of heads of new organization.

New York State Electric & Gas Corp., Albany, N. Y., will take over plants and

## INDUSTRIAL ACTIVITY

**Week's Projects Total \$25,500,000 and Programs for 1931 Reach \$95,000,000**

**N**EW construction requiring machinery and other equipment reported this week is \$25,500,000, compared with \$38,250,000 a week ago and \$21,750,000 in the first week of December.

Programs of building for 1931 total \$95,000,000, of which \$30,000,000 is in hydroelectric development; \$35,000,000 for expansion of telephone facilities in Pennsylvania; \$20,000,000 for expansion by the Susquehanna Power Co., and \$10,000,000 to be spent by the Port of New York Authority. The week's total of construction is distributed as follows:

Industrial and metal-working plants.....	\$6,000,000
Public utilities, electric and gas.....	7,000,000
Municipal and other public projects.....	5,800,000
Oil refineries and pipe lines.....	1,000,000
Railroad shops and terminals.....	5,700,000

Metal-working plants contribute more than \$1,000,000 to the week's total, foremost being a \$400,000 plant at Fruitvale, Cal., for a manufacturer of filters and mining equipment.

Other large industrial projects are a \$1,500,000 plant in East Brunswick Township, N. J., for Anheuser-Busch, Inc., of St. Louis, a \$300,000 zinc concentrating plant at Santa Ana, Cal., and a \$500,000 power plant at a paper mill in Fitchburg, Mass.

Public utility projects include a \$5,000,000 pipe line in Maryland for the Maryland Gas Transmission Corp., a \$1,000,000 generating plant at Westport, Md., for the Susquehanna Power Transmission Co., and a \$500,000 gas plant at Beatrice, Neb., for the Empire Gas Co.

Municipal and other public expenditures were swollen by a \$3,000,000 penitentiary at Lewisburg, Pa., and \$1,000,000 for airport improvements at New Orleans.

Oil company construction includes \$650,000 to be spent by the Great Lakes Pipe Line Co. for seven pumping stations and \$150,000 for a refinery addition at Luling, Tex., for the Magnolia Petroleum Co.

Railroad improvements are larger than for some weeks, and include \$3,000,000 for Canadian Pacific Railway shops in Ontario; \$1,200,000 for a central market terminal in Buffalo for the New York Central Railroad and a \$1,000,000 grain elevator in St. Louis for the Missouri Pacific.

Vocational school construction totaling \$4,500,000 includes a \$700,000 chemistry building and laboratory for the Massachusetts Institute of Technology in Cambridge, Mass.



properties of Binghamton Light, Heat & Power Co., Binghamton, N. Y., and will operate as unit of organization. Purchasing company contemplates improvements in Binghamton district, including transmission lines. A bond issue of \$6,700,000 was sold recently, part of fund to be used for expansion.

Don-Bar Mfg. Co., Inc., Syracuse, N. Y., recently organized by Frank A. Driscoll, 340 Montgomery Street, and associates, with capital of \$250,000 and 10,000 shares of common stock, no par value, plans operation of local factory for manufacture of garment-pressing machinery and parts. J. Arthur Moore, 202 Harvard Place, is interested in new company.

## New England

**C**ONTRACT has been let by Board of Trustees, Massachusetts Institute of Technology, Cambridge, to Stone & Webster Engineering Corp., 49 Federal Street, Boston, for chemistry building and laboratory, to cost about \$700,000 with equipment. Coolidge & Carlson, 89 State Street, Boston, are architects.

Gilbert & Barker Mfg. Co., Springfield, Mass., manufacturer of oil and gasoline pumps, oil burners, etc., a subsidiary of Standard Oil Co. of New Jersey, 26 Broadway, New York, has plans for a branch plant at Toronto, for production of full line of equipment, to be operated under name of Gilbert & Barker Mfg. Co., Ltd., an affiliated organization.

A. J. Lundem, Niantic, Conn., has purchased property, 75 x 100 ft., fronting on Niantic River for a boat-building and repair plant. Project will include a marine railway, and boat storage facilities.

Planet Mfg. Co., Westfield, Mass., recently formed with capital of \$50,000 by Percy N. Hall, 80 Elm Street, and associates, plans operation of local factory for manufacture of household tools, utensils and mechanical equipment. Mr. Hall will be treasurer. Robert Gowdy is president.

Rolls-Royce of America, Inc., Springfield, Mass., manufacturer of automobiles, will concentrate body-building branch at local plant and will remove Brewster branch from Long Island City, N. Y., to that point and expand operations.

John De Piero, 72 Main Street, Stamford, Conn., and associates have organized Connecticut Metal Specialties Co., with capital of \$50,000, and will operate local plant for production of machine equipment, metal parts, etc. Peter Pordon, 15 Soundview Avenue, will be secretary and treasurer.

New England Electric Co., 103 Allyn Street, Hartford, Conn., has asked bids on general contract for an equipment service, storage and distributing building, to cost over \$80,000 with equipment. Westcott & Mapes, 139 Orange Street, New Haven, Conn., are architects and engineers.

City of Springfield, Mass., has plans for an addition to its technical high school.

Bids are being taken by Crocker, Burbank & Co., Fitchburg, Mass., paper manufacturers, on a power plant addition, 60 x 80 ft., to cost \$500,000 with equipment.

Langeller Mfg. Co., Cranston, R. I., is considering plans for a machine shop addition.

Boston & Maine Railroad has started work on car repair shop additions at Concord, N. H., to cost \$427,000 with equipment.

Savage Arms Corp., has acquired Crescent Firearms Co., Norwich, Conn., and will take possession Jan. 1. Some new equipment is under consideration.

## Philadelphia

**T**RACT at Tioga and C Streets, 195 x 250 ft., has been purchased by Philadelphia Storage Battery Co., Ontario and C Streets, Philadelphia, manufacturer of electric storage batteries, radio equipment, etc., and will be used for four-story addition to cost more than \$150,000 with equipment. Plans will be drawn by William Steele & Sons Co., Fifteenth and Cherry Streets. Company will expand radio equipment production in new unit as well as in another plant at Allegheny and A Streets, just acquired. Improvements and alterations will be made in last-noted factory.

Philadelphia Electric Co., Tenth and Chestnut Streets, Philadelphia, is acquiring through United Gas Improvement Co., 1401 Arch Street, parent organization, a number of utility properties in Montgomery and Chester counties, and will carry out improvements and extensions. Southern Pennsylvania Power Co., another subsidiary of United Gas Improvement Co., is purchasing similar properties in York County, including Delta Electric Power Co., and Delta Water Power Co., and will merge with system, with transmission line and other expansion.

Bell Telephone Co. of Pennsylvania, 1835 Arch Street, Philadelphia, plans construction of several equipment storage, distributing and service plants, as well as automobile service, repair and garage buildings for company trucks and cars, and other mechanical structures in connection with State-wide expansion and improvement program during 1931, to cost \$35,000,000. Of this fund, outside plant appropriation will total about \$11,500,000. An appropriation of \$7,157,000 will be expended for installation of about 400,000 miles of lead-encased underground and aerial cable lines.

New Jersey Port Commission, Camden, N. J., has plans for a two-story storage, distributing and terminal building, 160 x 300 ft., with installation of conveying and other handling equipment, to cost \$500,000. Charles W. Staniford, 50 Church Street, New York, is engineer.

United & Consolidated Manufacturers Co., Philadelphia, has leased building at 5213 Filbert Street for manufacture of electrical equipment and parts.

J. Clifton Buck, Fidelity Philadelphia Building, Philadelphia, manufacturer of chemical and drug specialties, with plant at 105 North Fifth Street, has awarded general contract to Cramp & Co., Denckla Building, for three-story and basement addition, 30 x 50 ft., for storage and distribution, to cost over \$65,000.

Susquehanna Power Transmission Co., Lexington Building, Baltimore, an interest of Pennsylvania Water & Power Co., and Safe Harbor Power Co., same address, is planning erection of steel tower transmission line from Safe Harbor, Pa., where last-noted company is building new electric generating plant, to Westport, Md., and vicinity, to cost over \$1,000,000 with switching stations, etc. Project is scheduled for completion in 1932, and will represent total investment

of over \$20,000,000. Company engineering department is in charge.

Fuller-Lehigh Co., Fullerton, near Allentown, Pa., manufacturer of fuel-pulverizing machinery, pulverizing mills, tube mill equipment, etc., a subsidiary of Babcock & Wilcox Co., 85 Liberty Street, New York, manufacturer of water-tube boilers, etc., is arranging for removal of plant to Barberton, Ohio, within 60 to 90 days, where production will be consolidated with branch plant of parent organization. Plans are under way for addition to Barberton works, totaling about 40,000 sq. ft. floor space, to cost over \$75,000.

A public auction sale will be held Tuesday, Dec. 23, at Modern Experimental Machine Shop, Fourth and Hanover Streets, Pottstown, Pa. Industrial Plants Corp., 25 Church Street, New York, will be in charge. Machines to be disposed of include lathes, milling machines, drills and boring mills, grinders, shapers, planers and screw machines.

## South Atlantic

**C**ONTRACT has been let by Maryland Paper Board Co., 7 St. Paul Street, Baltimore, to C. T. Gardner, Childs, Md., for extensions and improvements in former mill of Marley Paper Mfg. Co., recently acquired at Childs Station, Md., to cost about \$25,000 with equipment. Company was organized recently. Walter G. Leimbach is one of heads of company.

Nathan Friedenber, Baltimore, machinery and hardware merchant, has leased three-story building at 128 West Pratt Street, totaling about 7000 sq. ft. floor space, for new storage and distributing plant.

Old Dominion Power Co., Norton, Va., is planning extensions in power station in Black Mountain district, near St. Charles, Va., for mining and industrial service.

Great Dane Co., Inc., Greenville, S. C., care of William Lowndess, Jr., 18 Williams Street, recently organized by Mr. Lowndess and associates, is planning early operation of local plant for manufacture of motor truck trailers and parts. Works will include assembling department.

Maryland Gas Transmission Corp., recently organized as a subsidiary of Columbia Gas & Electric Corp., 61 Broadway, New York, is planning construction of a pipe line in different parts of Maryland, including Baltimore district, for natural gas supply, to cost over \$5,000,000. Work will be carried out by Columbia Gas Construction Co., another subsidiary of Columbia Gas & Electric Corp.

Bristol Steel & Iron Works, Bristol, Va.-Tenn., is in market for a Hazel hammer, about 5 x 5 in., self-contained with air compressor unit.

Novelty Furniture Co., Kernersville, N. C., recently organized by Herman B. Melselman, Greensboro, N. C., and associates, with capital of \$100,000, plans operation of factory at Kernersville.

Public Improvement Commission, City Hall, Baltimore, plans installation of manual training equipment in new two-story and basement Northeast junior high school to cost \$500,000, for which bids are being asked on general contract until Dec. 24. William W. Emmart, Union Trust Building, is architect. H. J. Leimbach is supervising engineer for commission.

J. E. Hurley, 1219 Ohio Avenue, N. W., Washington, operating a machine and

repair shop, has plans for a new one-story machine works, 75 x 93 ft., to cost about \$25,000 with equipment. George T. Santmyers, 1418 I Street, is architect.

Town Council, Falls Church, Va., plans installation of 200,000-gal. tank, pumping machinery and other equipment in connection with extensions and improvements in municipal waterworks, to cost over \$100,000.

## Chicago

PLANS are under way by Cities Service Oil Co., Tulsa, Okla., for bulk oil storage and distributing plant at Joliet, Ill., to cost over \$50,000 with equipment.

East St. Louis Rendering Co., National City, Ill., plans rebuilding of part of plant recently destroyed by fire, with loss over \$75,000 including equipment.

Northern Pacific Railway Co., Railroad Building, St. Paul, Minn., contemplates extensions in engine house and shops at Mississippi and York Streets, to cost about \$40,000 with equipment. Work will begin early next year. O. M. Rognan, address noted, is company architect.

Iowa Light & Power Co., Des Moines, Iowa, and affiliated organizations, Des Moines Electric Co., and Des Moines Gas Co., are arranging for expansion and improvements in 1931 to cost \$750,000, including extensions in power plants and transmission lines, also pipe lines for gas distribution. A fund of \$150,000 will be used for additions in transmission system in rural districts.

Northwest Automatic Products Co., 138 Holden Street, Minneapolis, manufacturer of mechanical specialties, has plans for a one-story factory on Fourth Street, 85 x 88 ft., to cost over \$40,000 with equipment. Martin G. Lindquist, Security Building, is architect.

Board of Trustees, Iowa State College, Iowa City, Iowa, has secured an appropriation of \$60,000 for a new mechanical engineering laboratory, for which plans will soon be drawn. State architect, Des Moines, will be in charge.

Fort Dodge Gas & Electric Co., Fort Dodge, Iowa, will carry out expansion and improvements at local steam-operated electric power plant to cost close to \$200,000, of which about \$135,000 will be expended for equipment. Company engineering department is in charge.

Board of Public Welfare, City Hall, Minneapolis, is considering one-story industrial plant at municipal workhouse at Parkers Lake, to cost over \$65,000 with equipment.

C. W. Olson Mfg. Co., 1300 Quincy Street, N. E., Minneapolis, operating an ornamental and architectural iron works, has begun foundations for a new one-story foundry, 35 x 71 ft., for which general contract recently was let to Robert H. McGuffie, 1201 Twenty-seventh Avenue, N. E.

Howell Machine Works, Inc., 128 North Jefferson Street, Chicago, recently organized by David Howell and associates with capital of \$25,000, plans operation of local machine and repair shop for parts and assembling. Ralph D. Shanessy is interested in new company.

Oliver Farm Equipment Co., Chicago, has resumed operations at its Battle Creek, Mich., plant. This follows a recent announcement of full operations at company's tractor plant at Charles City, Iowa. South Bend, Ind., and Springfield, Ohio, plants have resumed operation on a moderate scale.

## Cleveland

PLANS are being completed by Yoder Co., 5500 Walworth Avenue, Cleveland, manufacturer of special machinery and parts, for one and two-story addition, to cost over \$150,000 with equipment. W. H. Hatch, Hippodrome Building, is architect.

Electromatic Gas Control Corp., Cleveland, recently organized to manufacture a special electrical device for regulation of gas for hot water heaters and kindred equipment, will operate a plant at 1802 Columbus Road, S. W. William Bauer is president of new company, and George Herbst, 3335 West Eighty-eighth Street, vice-president.

Department of Public Service, Wells-ville, Ohio, will soon take bids for water meters for city service, for which a bond issue of \$25,000 has been sold.

Moto-Meter Gauge & Equipment Corp., 511 Hamilton Street, Toledo, Ohio, manufacturer of automotive equipment, gages, etc., is planning expansion at local factory, including additional equipment. Similar work will be carried out at branch plant at La Crosse, Wis. Entire project will cost over \$100,000. Company has recently acquired a new fuel-saving device, invented by Dr. Miller Reese Hutchinson, and will arrange facilities for production.

Cleveland Railway Supply Co., Cleveland, recently organized, has established offices at 914 Swetland Building, and plans operations for supplies for steam railroads, including track equipment, etc. A storage and distributing plant will be operated. W. H. Frazier is president.

Cleveland Provision Co., 2527 Canal Road, Cleveland, has asked bids on general contract for two-story and basement meat-packing plant, to cost over \$200,000 with machinery. H. Peter Henschien, 1637 Prairie Avenue, Chicago, is architect and engineer.

## Milwaukee

FORMER plant of Townsend Tractor Co., Janesville, Wis., has been purchased by General Motors Corp. to round out commercial car production unit for Janesville division of Chevrolet Motors. Townsend shop is being rehabilitated and re-equipped. Two commercial car body shops in Janesville were acquired some time ago.

Frank Hamacheck Machine Co., Kewaunee, Wis., manufacturer of field implements for vegetable and fruit canning, has plans for an extension to its machine shop and also for a new foundry unit, to be built early next spring. No estimate of cost has been made. Frank Hamacheck, Jr., is president and general manager.

Northern Paper Mills, Inc., Day Street, Green Bay, Wis., is preparing to build four mill additions next year at a cost of about \$250,000. First of new group will be a chemical laboratory and office building. H. W. Gochbauer is chief plant engineer.

Metalware Corp., Two Rivers, Wis., manufacturer of mechanical toys, electrical appliances, etc., has increased its capitalization from \$350,000 to \$400,000 as another step in growth of the business. Last increase, in 1925, was from \$300,000 to \$350,000. Remus Koenig is president.

John Rauschenberger Co., 85 West Water Street, Milwaukee, manufacturer

of rope and other hemp products, is taking bids until Dec. 20 through Dick & Bauer, Inc., architect and engineer, 208 Third Street, for a two-story extension, 73 x 332 ft., main works, to cost about \$100,000 complete.

Heil Co., 3000 West Montana Street, Milwaukee, is transferring entire operation of Milwaukee Air Power Pump Co. and Combustion Fuel Oil Burner Co., acquired some time ago, to its own plant and will lease or sell pump and burner shops at 8-16 Keefe Avenue. Julius P. Heil is president.

Farmers Union Terminal Association, Minnesota Building, St. Paul, Minn., is preparing to build a 2,000,000-bu. addition to grain elevators at Superior, Wis., to cost about \$200,000. M. W. Thatcher is general manager.

City Clerk, Superior, Wis., closed bids Dec. 17 for new municipal garage and machine shop, 75 x 140 ft., one-story, to cost about \$25,000. Roland C. Buck is engineer.

## Cincinnati

GENERAL contract has been let by Heekin Can Co., 435 New Street, Cincinnati, manufacturer of tin cans, pails, etc., to Ferro Concrete Construction Co., Third and Elm Streets, for four-story and basement addition, 127 x 161 ft., including improvements in present factory, to cost over \$150,000 with equipment. Company has purchased plant and business of Pacific Can Co., San Francisco, and will consolidate. New subsidiary will be formed under name of Heekin Pacific Can Co., to take over and expand property.

Chrysler Corp., 341 Massachusetts Avenue, Detroit, is arranging for early removal of motor parts plant from Dayton, Ohio, to main works at Detroit, where production will be concentrated. Dayton plant has been in service since company acquired Maxwell Co., five years ago, and used for parts production for Chrysler and Plymouth automobiles.

Pacific Coal Co., Mercer, Ky., is planning to rebuild motor-generator plant and mechanical fan house recently destroyed by fire, with loss of about \$25,000.

Tennessee Corp., Copperhill, Tenn., formerly known as Tennessee Copper & Chemical Co., is arranging for expansion and improvements at local plant, including new buildings and installation of equipment, to cost over \$1,000,000. Work will be carried out during 1931.

Board of Education, Ashland, Ky., is planning installation of manual training equipment in new multi-story junior high school to cost \$200,000. Henry N. Foster, Grand Theater Building, is architect.

Contracting Officer, Wright Field, Dayton, Ohio, will receive bids until Dec. 22 for cutters, dies and collets, dies and taps, steel rules, steel tapes, dividers, gages, etc., 200 to 600 rate of climb indicator assemblies, and 200 to 600 bank and turn indicator assemblies, 400 to 800 tachometer assemblies, 400 to 800 clock assemblies; until Dec. 23 for 399 generator assemblies, 708 starter assemblies, for 240 electric trigger control type solenoid assemblies, and until Dec. 22 for 27 fire extinguishers.

Tennessee Electric Power Co., Chattanooga, Tenn., has purchased Nashville Railway & Light Co., Nashville, Tenn., and will consolidate. Expansion and improvements will be carried out, including transmission line construction.



## Pittsburgh

**P**LANS are under way by Struthers-Wells-Titusville Corp., Titusville, Pa., manufacturer of oil well supplies and equipment, for one-story addition, to cost close to \$65,000 with equipment.

Treasury Department, Washington, office of James A. Wetmore, supervising architect, is asking bids until Dec. 30 for new Federal penitentiary at Lewisburg, Pa., including factory unit, 62 x 202 ft., automobile service and garage building, 26 x 125 ft., storage and distributing building, 43 x 129 ft., and other mechanical units, to cost \$3,000,000.

Dravo Contracting Co., Neville Island, Pittsburgh, is planning establishment of new stone quarry at Ellwood City, Pa., where property has been secured, with installation of quarrying and crushing machinery, conveying, and other equipment, to cost over \$50,000.

Hurley Machine Co., West Twenty-second Street and South Fifty-fourth Avenue, Chicago, manufacturer of vacuum cleaners, parts, etc., a subsidiary of Electric Household Utilities Corp., same address, has leased building at 216 Penn Avenue, Pittsburgh, for local factory branch, storage and distributing plant.

## St. Louis

**B**IDS will be asked on general contract early in January by Missouri Pacific Railroad Co., Thirteenth and Olive Streets, St. Louis, for superstructure for grain elevator at Kansas City, Mo., to cost about \$1,000,000 with equipment. Structure will be operated under lease by Continental Export Co., Merchants Exchange Building, St. Louis. E. M. Tucker, Railway Exchange Building, St. Louis, is engineer.

Great Lakes Pipe Line Co., Ponca City, Okla., has awarded contract to Arthur G. McKee & Co., 2422 Euclid Avenue, Cleveland, for seven pumping stations, with boiler plants and other mechanical units along route of its pipe line from Ponca City to Des Moines, Iowa, now under construction. Pumping plants and equipment will cost \$650,000.

City Council, Cushing, Okla., will issue bonds for \$300,000, fund to be used for a municipal electric light and power plant. City engineering department is in charge.

City Council, Oklahoma City, has called a special election to approve a bond issue for municipal improvements, including fund of \$175,000 for erection of a city-owned automobile service, repair and garage building and fire house. George F. Brown is city engineer.

Board of Education, Arkadelphia, Ark., contemplates installation of manual training equipment in new two-story senior high school to cost \$100,000. Petter & McAninch, Pyramid Life Building, Little Rock, Ark., are architects.

Plant of Command-Aire, Inc., Little Rock, Ark., has been purchased at receiver's sale by N. G. Romich, heretofore general manager of company, and will be operated for present as an aircraft repair and reconditioning plant. Production of aircraft will be resumed later.

Springfield Tablet Mfg. Co., Springfield, Mo., manufacturer of paper goods, is considering a three-story and basement addition, to cost over \$65,000 with equipment.

Century Electric Co., 1806 Pine Street, St. Louis, manufacturer of electric mo-

tors, fans, etc., has plans for one-story foundry addition, 40 x 286 ft., to cost over \$60,000 with equipment. Edward J. Lawler, 3727 Market Street, is architect.

Empire Gas Co., Beatrice, Neb., has begun erection of artificial gas plant to cost over \$500,000 with equipment. W. W. Smith is resident manager in charge.

American Railway Express Co., 1730 Clark Avenue, St. Louis, has plans for a one-story automobile service, repair and garage building, to cost over \$100,000 with equipment.

General Welding Products, Inc., 5027 McKissock Avenue, St. Louis, manufacturer of storage tanks, has purchased one and a half acres, with a one-story building containing about 15,000 sq. ft. of floor space, at East St. Louis, Ill. Structure is being remodeled and ultimately all operations will be transferred to East St. Louis.

Nu-Way Machine & Die Works, formerly at 2353 Chestnut Street, St. Louis, has moved to 1235 Piggott Avenue, East St. Louis, Ill.

## Detroit

**P**LANT of Autorad Electric Corp., Adrian, Mich., manufacturer of electric equipment, has been purchased by Sparks-Withington Co., Jackson, Mich., manufacturer of automotive products, radio equipment, etc. Purchasing company plans to use property for a branch plant later.

Ford Motor Co., Dearborn, Mich., is arranging for production of complete line of steel commercial automobile bodies early next year, supplementing present line of light truck bodies, and will arrange facilities for manufacture at several plants.

John A. Merrill, Chelsea, Mich., and associates have organized Chelsea Foundry & Mfg. Co., with capital of \$50,000, and plan operation of local foundry for manufacture of gray iron, steel and other metal castings. Francis J. Baldecker, Dearborn, Mich., is interested in new company.

Chevrolet Motor Co., 3044 West Grand Boulevard, Detroit, is considering new plant at Oklahoma City for manufacture of commercial automobile bodies, to be operated as Commercial Body Division of Chevrolet company, to cost over \$90,000 with equipment. Arrangements are under way for similar plant at Knoxville, Tenn., with body assembling and service departments.

Cohodas Brothers, Ishpeming, Mich., is erecting one-story and basement cold storage and refrigerating plant, 127 x 176 ft., to cost about \$80,000 with machinery. Contract recently was let to Carl Erickson, Ishpeming.

General Motors Corp., Detroit, is considering an expansion and improvement program at malleable iron foundry at Saginaw, Mich., with additional equipment for furnace, annealing and other branches of production. David O. Thomas is general manager at plant.

Detroit Edison Co., 2000 Second Avenue, Detroit, contemplates construction of coal unloading dock at Connors Creek power plant, with installation of coal-handling, conveying and other mechanical equipment, to cost over \$80,000. Company engineering department will be in charge.

Ray N. Stapert, Kalamazoo, Mich., architect, has plans for a paper mill unit at Hollandsburg, Mich., for a company whose name is temporarily withheld, to

cost over \$85,000 with equipment. Bids will be asked on general contract early next year.

## Gulf States

**C**ONTRACT will soon be let by City Council, Montgomery, Ala., for four hangars, each 110 x 220 ft., at municipal airport, Maxwell Field, with repair and reconditioning facilities, to cost over \$125,000 with equipment.

Golden West Oil Co., Western National Bank Building, San Antonio, Tex., has leased one-story building to be erected on San Marcos Street, for new storage and distributing plant, to cost close to \$40,000 with equipment.

McDorgan-Phillips Packing Corp., Mobile, Ala., has awarded general contract to Dye & Mullings, Columbia, Miss., for one-story food products canning plant at last noted place, 85 x 250 ft., to cost about \$85,000 with machinery. Project will include a one-story machine shop and boiler house. A. J. Kressler, Mobile, is company engineer.

Orleans Levee Board, New Orleans, plans group of 20 hangars, with repair and reconditioning shops, at proposed municipal airport on Lake Pontchartrain where 300 acres is available. Facilities for repair and housing of seaplanes will also be provided. Entire development will cost about \$1,000,000. John Klorer is chief engineer.

Swift & Co., Union Stock Yards, Chicago, meat packers, have awarded contract to Johnson Construction Co., Waco, Tex., for new two-story meat-packing plant at Cuero, Tex., to cost about \$50,000 with equipment.

Mississippi Industrial Gas Co., Jackson, Miss., is planning extensions in pipe lines for natural gas supply at McComb, Hazlehurst, Terry, Magnolia and vicinity, to cost over \$100,000 with equipment.

Empire Companies, Inc., Bartlesville, Okla., is considering plans for new gasoline refinery near Pampa, Tex., to cost close to \$70,000 with equipment.

City Council, Colfax, La., contemplates extensions and improvements in municipal electric light and power plant, including additional equipment, to cost about \$40,000.

Preston Road Fresh Water District, Dallas, Tex., plans installation of elevated steel tank and tower and other mechanical equipment in connection with extensions and improvements in water system. Koch & Fowler, Central Bank Building, Dallas, are consulting engineers.

Common Council, Temple, Tex., has asked bids on general contract for a municipal electric light and power plant.

Atlanta & West Point Railroad Co., Montgomery, Ala., plans rebuilding local car repair building and storage and distributing unit, adjoining, recently partially destroyed by fire, with loss close to \$25,000 including equipment. O. T. Nelson, Atlanta, is chief engineer.

Magnolia Petroleum Co., Dallas, Tex., has work under way on addition to oil refinery at Luling, Tex., to cost over \$150,000 with equipment.

Southern United Ice Co., Jackson, Miss., has plans for a new ice-manufacturing plant at Belzoni, Miss., to cost over \$65,000 with machinery.

Birmingham Engine & Machinery Corp., Birmingham, is inquiring for a used motor-driven 42-in. engine lathe with bed of 30 to 40 ft.

## Indiana

**B**OARD of State Institutions, Indianapolis, has approved plans for new power house at School for Feeble-Minded, Butlerville, to cost about \$50,000 with equipment. O. B. Little, 307 North Illinois Street, Indianapolis, is engineer.

Marmon Motor Car Co., 1101 West Morris Street, Indianapolis, will establish a body-building and finishing plant in unit known as building No. 3. Part of structure will be occupied by Hayes Body Corp., Grand Rapids, Mich., for a fabricating plant for production of Marmon bodies, with finishing division operated as department of Marmon company. New plant is scheduled for service early next year.

E. Vernon Knight, New Albany, Ind., chairman of board, United Plywood Corp., with local mill, has acquired plant of Franklin Mfg. Co., Franklin, Ind., manufacturer of office furniture, desks, etc., in receivership for past two years, and will remodel for early production.

Carl H. Billman, Logansport, Ind., and associates have organized Ball-Billman Corp., and plan operation of local factory for manufacture of sand blast equipment and supplies. William Ball, Logansport, will be an official of new company.

Stutz Motor Car Co. of America, Inc., 1002 North Capitol Avenue, Indianapolis, manufacturer of custom automobiles, parts, etc., has arranged for a common stock issue of 81,974 shares, part of proceeds to be used for operations and expansion.

## Pacific Coast

**B**IDS will be asked on general contract in about 60 days by Oliver United Filters Co., Fourth and Madison Streets, Oakland, Cal., manufacturer of filtering equipment, mining machinery, etc., for new plant at Fruitvale, Cal., to cost over \$400,000 with equipment. Reed & Corlett, Oakland Bank of Savings Building, Oakland, are architects.

Board of Education, San Bernardino, Cal., plans one-story vocational shop unit at new high school group to cost over \$250,000, for which bids have been asked on general contract. DeWitt Mitcham, Platt Building, San Bernardino, is architect.

Santa Maria School District, Santa Maria, Cal., has plans for a manual training shop in connection with a new school to cost about \$100,000. Bids will soon be asked on general contract. Louis N. Crawford, Gibson-Drexler Building, Santa Maria, is architect.

F. L. De Sanno, 4437 East Tenth Street, Oakland, Cal., has awarded general contract to R. C. Porter & Co., 456 Adeline Street, for one-story machine shop and foundry, to cost close to \$25,000 with equipment.

Copperconda Mines Co., 118 East Fifth Street, Santa Ana, Cal., Robert O. Gruwell, Jr., president, has taken over property on Gertrudes Place for a new refinery for zinc concentrates, to cost \$300,000 with machinery. Present three-story building on site will be remodeled and used in connection with development program.

Board of City Commissioners, Portland, Ore., has applied to State Water Board for permission to use water in Wasco and Sherman Counties for hydroelectric

power development, consisting of five plants, with power dams from 63 to 118 ft. high. First station will have a capacity of 35,800 hp., to cost \$3,149,300; second plant, capacity 47,500 hp., to cost \$4,136,000; third plant, capacity 44,480 hp., costing \$3,916,000; fourth plant, capacity, 33,238 hp., costing \$2,916,000; and fifth plant, capacity of 51,133 hp., to cost \$4,500,000. Entire project with transmission lines, switching stations, etc., will cost close to \$20,000,000. Ralph C. Clyde is city commissioner in charge.

Bacon & Matheson Forge Co., 17 West Lander Street, Seattle, is planning immediate rebuilding of part of plant recently destroyed by fire, with loss of about \$50,000 including equipment.

Tourtellotte Bradley, Inc., 316 Seneca Street, Seattle, manufacturer of metal furniture, hollow metal goods, etc., has leased one-story plant, 65 x 190 ft., to be erected on West Galer Street, for which general contract has been let to I. N. Daily, Lloyd Building. New works will cost over \$65,000 with equipment. Gavin C. Wothspoon, Lloyd Building, is engineer.

Arizona Edison Co., Phoenix, Ariz., has applied for permission to erect five artificial gas plants and systems at Gila Bend, Florence, Superior, Winkelman and Casa Grande, to cost over \$200,000 with equipment. Company engineering department is in charge.

## Canada

**T**ENDERS have been received by James McLaren Co., Ltd., Buckingham, Que., for construction of a power plant between Masson and Buckingham, to cost \$10,000,000. Directors have not yet decided when contracts will be awarded. H. K. Ferguson Co., 25 West Forty-third Street, New York, is engineer.

Superheater Co., Ltd., Drummond Street, Sherbrooke, Que., will erect a two-story addition, 38 x 140 ft., to cost \$50,000.

Construction work will start early next year on shops and roundhouse at Tecumseh and Windsor, Ont., costing \$3,000,000, for Canadian National Railways and Wabash Railway. H. W. Mathews, St. Thomas, Ont., is superintendent.

Building Products, Ltd., Beach Road, Hamilton, Ont., has awarded contract to J. Morris, 215 Edgemont Avenue, South, for an addition, to cost \$13,000.

G. Ober & Sons, 110 East Lombard Street, Baltimore, contemplate erection of fertilizer plant at Tillsonburg, Ont., to cost \$50,000. F. E. Gregory, Leamington, Ont., is Canadian representative.

Tenders are being received for a one-story factory, 150 x 160 ft., at Oshawa, Ont., for Oshawa Chamber of Commerce, to be occupied by Coulter Mfg. Co., subsidiary of Coulter Copper & Brass Co., 115 Sumach Street, Toronto. Bids on equipment will be called later.

William Pickell, McHenry Street, Forest, Ont., will start work soon on a one-story stave mill, 40 x 50 ft., for which equipment will be purchased.

Acme Brick Co., Ltd., Alberta Block, Calgary, Alta., will spend \$25,000 on improvements to plant at Cannell, Alta.

Kennogg Mann Incinerator Co., Ltd., Buffalo, is contemplating establishing a plant at Toronto, to manufacture parts for incinerators, etc.

Dennisteel, Ltd., London, Ont., is contemplating plant addition to cost \$50,000. Work will not begin until next spring. C. E. Jarman is managing director.

Ryan, Scully & Co., 3711 Wissahickon Avenue, Philadelphia, specialists in design and construction of industrial heating equipment, have arranged with Railway & Power Corp., Ltd., 171 Eastern Avenue, Toronto, for manufacture and sale of Ryan-Scully products in Canada. Canadian company has a machine shop and foundry at Toronto and warehouse facilities at Montreal, Hamilton, Winnipeg, Manitoba, Vancouver, B. C., and New Glasgow, N. S.

## Foreign

**T**RACT of 30 acres on Calzada de Guadalupe, Mexico City, Mexico, has been purchased by Ford Motor Co., Dearborn, Mich., as site for new assembling plant. Plans are under way for one-story unit, 380 x 600 ft., with power house and other structures. Plant will have output of about 100 cars and trucks a day, and will include department for body manufacture, to cost over \$1,000,000 with equipment. It is understood that plans will be prepared by Albert Kahn, Inc., Detroit, architect and engineer.

Whessoe Foundry & Engineering Co., Ltd., Darlington, England, has arranged with Arthur G. McKee & Co., 2422 Euclid Avenue, Cleveland, engineers and contractors, to act as exclusive manufacturer and distributor of McKee blast furnace and oil refining equipment in Great Britain, and will arrange plant facilities for new line of production.

General Swedish Electrical Co., known as ASEA, Vasteras, Sweden, operating electric power properties, iron and steel mills and other industrial plants, has acquired Luth & Rosen Electrical Co., Stockholm, operating electric power plants and systems, and will consolidate. By this acquisition first noted company will operate about 80 per cent of high-tension transmission lines in country, and is planning expansion in several districts. Company is capitalized at 75,000,000 kroner (about \$19,500,000); J. S. Edstrom is president.

Soyusmaiso (Government Meat Trust), Soviet Russian Government, Moscow, has engaged H. Peter Henschien, 1637 Prairie Avenue, Chicago, architect and engineer, to prepare plans for two large meat-packing plants at Moscow and Semipalatinsk, Siberia, respectively, to cost \$10,000,000 with equipment, to include conveying and other material-handling machinery. Work will begin early in spring. These plants will be followed by a chain of 38 other such factories, a fund of \$80,000,000 being arranged for entire project and which is to be completed during 1933. Semipalatinsk has established Chicago headquarters care of Mr. Henschien, with N. L. Volynski, vice-chairman, in charge, for selection of equipment, etc. Amtorg Trading Corp., 261 Fifth Avenue, New York, is official buying agency for Soviet Government.

Firestone de La Argentina, a subsidiary of Firestone Tire & Rubber Co., has authorized Dwight P. Robinson & Co. of Argentina, Inc., a division of United Engineers & Constructors, Inc., to build a new tire manufacturing plant and power house at Buenos Aires. Construction work will begin at once.



## To Test Stainless Steel Tubes for Oil Refineries

The Republic Steel Corp. is building a new furnace in its laboratory at Canton, Ohio, for the purpose of conducting a series of important experiments with rustless steel tubes for oil refineries. With the new equipment, the company's metallurgists expect to develop steels possessing certain properties to meet special requirements of the oil cracking industry.

Republic's Enduro stainless steels are now used in the oil industry where material is needed to withstand high temperatures and pressures, and further developments are looked for which will greatly widen the market in this field.

The new furnace will test stainless tubes to destruction under high temperatures and pressures. This will make it possible for metallurgists to study the behavior of the tubes under conditions equal to and exceeding those found in actual service. The new testing furnace consists of an outer casing of steel approximately 2½ ft. sq. by 4 ft. long. In the center of this casing, and insulated from it, is an extra-heavy wall, 7-in. diameter pipe which serves as the heating chamber. It is heated by four gas-burners above and below the pipe.

The tube to be tested is then placed in the center of the heating chamber and, with the use of CO<sub>2</sub> gas, very high pressures are obtainable and it is possible to break the tube at any given temperature. The tube under test is plugged at each end with a heavy steel plug which is welded in. The CO<sub>2</sub> gas is introduced into the tube through extra heavy ¾-in. pipe and a hydraulic gage registers the pressure.

## Symbols for Chrome-Nickel Steel Standardized

Fifty-one steel producers have agreed to standardize specification symbols for chrome-nickel steel produced within agreed analysis ranges. The action was accomplished by agreement on the part of those companies producing chrome-nickel steels

under license by the Krupp Nirosa Co.

The adopted symbols with their ranges of agreed manufacturing analysis are reproduced in the table.

## General Electric Extends Unemployment Plan

A stabilization of employment plan whereby employees of the incandescent lamp department of the General Electric Co. of not less than two years continuous service will be guaranteed 50 weeks' work for the year 1931, has been announced by President Gerard Swope and will become effective Jan. 1, 1931, upon acceptance by 60 per cent of the eligible employees.

In June of this year President Swope announced a comprehensive plan to minimize the cause and effect of unemployment in the company. The plan provided, first, for the stabilization of employment and, secondly, for the relief of the unemployed. Because of unemployment conditions in apparatus works of the company all employees, beginning Dec. 1, are paying 1 per cent of wage or salary into the unemployment pension fund. Such collections will be made through December and longer if necessary. Employees of the various incandescent lamp works, about 8000 in number, did not come under the provisions of the plan as announced in June.

"Stabilization of employment," explains Mr. Swope, "is much simpler in those departments where the product has been standardized and where there is less risk of obsolescence and deterioration. The product of the incandescent lamp department is notably one of these. The plan for a guarantee of work under certain conditions is offered as a result of the stabilization of production and employment in the incandescent lamp department."

Production of babbitt metal for sale in October by 21 companies, which report their monthly sales to the Bureau of Census, was 1,962,156 lb., compared with 1,730,269 lb. in September.

## New York Iron and Steel Market

(Concluded from page 1874)

No. 1 heavy melting steel, but only a small tonnage is moving to consumers. The mill at Coatesville, Pa., is delaying deliveries because of the large supply in its yard. The only grades of scrap on which prices show a change are steel carwheels, which are off \$1 a ton to \$14, New York, the offering price of brokers, and heavy breakable cast scrap, which is slightly stronger. A broker filling a \$10.50 order for this grade with a Florence, N. J., consumer, is paying \$10.75 a ton, delivered, to obtain sufficient material of good quality.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel...	\$7.50
Heavy melting steel (yard) \$5.25 to	5.50
No. 1 hvy. breakable cast... 6.75 to	7.75
Stove plate (steel works)...	5.00
Locomotive grate bars....	5.00
Machine shop turnings...	3.50
Short shoveling turnings...	3.50
Cast borings (blast fur. or steel works) .....	3.50
Mixed borings and turnings .....	3.00
Steel car axles.....	14.00
Iron car axles .....	19.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	7.25
Forge fire .....	7.00
No. 1 railroad wrought...	8.75
No. 1 yard wrought, long...	7.75
Rails for rolling..... 9.25 to	9.75
Stove plate (foundry)....	5.50
Malleable cast (railroad)...	9.50 to 10.00
Cast borings (chemical)...	8.50 to 9.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast.....	\$12.50
No. 1 hvy. cast (columns, bldg. materials, etc.) .....	10.50
No. 2 cast (radiators, cast boilers, etc.) .....	10.00

## Chicago Iron and Steel Market

(Concluded from page 1872)

show the usual placing of tonnage often experienced near the end of the year. Inquiries are not at hand for this move. Competition is still rife, and prices are cut to the bone even on the small-tonnage, high-cost orders.

## Warehouse Business

Warehouses are announcing new extras on wide black sheets as follows: No. 18 gage, 42 in. wide, old 5c. per 100 lb. extra eliminated; No. 18 gage, 48 in. wide, old extra 5c., new, 15c.; No. 20 gage, 42 in. wide, old 15c. extra eliminated; No. 20 gage, 48 in. wide, old 25c. extra remains; No. 22 gage, 42 in. wide, old extra, 40c., new, 20c.; No. 22 gage, 48 in. wide, old extra, 40c., new, 50c.; No. 24 gage, 42 in. wide, old extra, 40c., new, 30c.; No. 26 gage, 42 in. wide, old extra, 40c., new, 50c.; No. 28 gage, 36 in. wide, old extra, 10c., new, 15c.

## Coke

Shipments of Chicago by-product foundry coke are steady, and prices, as gaged by a few spot sales, are steady at \$8 a ton, local ovens.

Standardized Symbols for Nirosa, Designating Type of Steel Within Classifying Ranges

Base symbols:

KA<sub>2</sub> for austenitic chrome-nickel alloys in the corrosion-resistant field.  
KNC for austenitic chrome-nickel alloys in the heat-resistant field.

For wrought material:

	Carbon, Per Cent	Sulphur and Phos- phorus, Per Cent	Sili- con, Per Cent	Chro- mium, Per Cent	Nickel, Per Cent	Molyb- de- num, Per Cent
KA <sub>2</sub>	0.16 max.	0.6	0.03	0.75	16.5 to 20.0	7 to 10.5
KA <sub>2</sub> -S	0.07 max.	0.6	0.03	0.75	16.5 to 20.0	7 to 10.5
KA <sub>2</sub> -H	over 0.16	0.6	0.03	0.75	16.5 to 20.0	7 to 10.5
KA <sub>2</sub> -Mo	0.16 max.	0.6	0.03	0.75	18.0 to 22.0	7 to 10.5
KA <sub>2</sub> -SMo	0.07 max.	0.6	0.03	0.75	18.0 to 22.0	7 to 10.5
KA <sub>2</sub> -HMo	over 0.16	0.6	0.03	0.75	18.0 to 22.0	7 to 10.5

The same symbols are used for cast material where silicon max. limit is higher.

For wrought and cast material:

KNC-3	0.20 max.	0.7	0.03	2.0	23.0 to 27.0	17.0 to 21.0
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# Soviet to Start Construction of Great Ural Steel Plant in April

(By Cable)

LONDON, ENGLAND, Dec. 15.

THE November output of Russian iron and steel was 85 per cent of the program and included 314,000 tons of pig iron and 329,000 tons of open-hearth steel.

The authorities have approved the plan to build the Novo Tagil Steel Works in the Ural district, with an annual capacity of 1,100,000 tons of pig iron and 650,000 tons of rolled steel. Construction work will begin in April.

The Ford interests have secured orders for 2200 motor cars and lorries in parts to be assembled at Nijni-Novgorod.

The Krupp and Tiefbau interests have secured a contract to build the Nile bridge on a bid of 3,500,000 marks (\$833,000).

The Skoda Steel Works, A. G., Prague, Czechoslovakia, is reported to have orders booked to the value of 3,500,000,000 kr. (\$103,500,000), permitting operations on the present scale until 1932.

The South African Iron & Steel Industrial Corporation has accepted all tenders for building the South African steel works and an immediate start on construction is probable.

It is expected that a further £50,-

Russian iron and steel output was 85 per cent of program in November.

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British warships placed with private builders for construction over five years.

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Assouan Dam in Egypt will require more rustless steel plates.

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Japan seeking valuation basis for merger of all steel mills into single corporation.

settled the difficulties between Belgian and American mills.

The British Admiralty is awarding ships totaling £8,000,000 (\$38,880,000), including one cruiser and eight destroyers. Placed with private builders, the work is being spread over the next five years.

November exports of pig iron by the United Kingdom were 16,000 tons, of which the United States was sent 2700 tons. Total iron and steel exports were 204,000 tons.

British buyers are further narrowing their steel purchases as the holidays and end of the year approach. Continental markets developed temporary activity, but demand has now slackened although prices continue steady.

About 97 per cent of the tin plate mills are now in the pooling plan and are considering proposals for controlled selling, which would involve minimum prices. Further meetings are being held to work out details.

The tin plate market is moderately active, but low prices are quoted by some sellers who are influenced by lower tin prices and sales have been made at 15s. 4½d. (\$3.74) per base box. Most works, however, are unwilling to accept less than 16s. (\$3.89) per base box, f.o.b. works port.

There is a little more activity in

000 to £60,000 (\$243,000 to \$291,000) of stainless steel plates will be required by the new contractors on the Assouan Dam in Egypt.

German domestic consumers are expecting reductions in the German Cartel prices and are withholding orders so that mills have been reduced to rolling for stock.

Sheffield stainless steel interests are forming a company with £1,000,000 (\$4,866,000) capital to manufacture household utensils on a mass production basis.

The International Rail Makers' Association has reaffirmed prices and

## British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at \$4.8665 (par)

### British Prices f.o.b. United Kingdom Ports

Ferromanganese, export.	£11 5s.	to £11 10s.	\$54.75 to \$55.95
Billets, open-hearth...	5 12½	to 6 5	27.34 to 30.41
Black sheets, Japanese specifications	12 5		59.61
Tin plate, per base box..	0 15½	to 0 16	3.77 to 3.89
Steel bars, open-hearth..	7 15	to 8 5	1.69 to 1.79
Beams, open-hearth....	7 7½	to 7 17½	1.60 to 1.71
Channels, open-hearth...	7 12½	to 8 12½	1.66 to 1.87
Angles, open-hearth....	7 7½	to 7 17½	1.60 to 1.71
Black sheets, No. 24 gage	9 0	to 9 5	1.95 to 2.01
Galvanized sheets, No. 24 gage	11 5		2.44

### Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£2 11s.	to £2 12s.	\$12.40 to \$12.65
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Billets, Thomas (nominal)	£3 14½s.	to £3 15s.	\$18.12 to \$18.24
Wire rods, low C., No. 5			
B.W.G.	5 2½	to 5 7½	24.94 to 26.15
Rails, light	6 0		29.20
Black sheets, No. 31 gage, Japanese	11 5	to 12 12	54.68 to 58.32
Steel bars, merchant...	4 7½	to 4 10	0.93 to 0.97
Beams, Thomas, British standard (nominal)...	3 19	to 4 0	0.86 to 0.87
Channels, Thomas, American sections	5 12	to 5 14	1.24 to 1.26
Angles, Thomas, 4-in. and larger, over ¾-in. thick	4 2	to 4 3	0.88 to 0.89
Angles, Thomas, 3-in.	4 5	to 4 6	0.91 to 0.92
Hoop and strip steel over 6-in. base	4 12½	to 4 15	0.99 to 1.01
Wire, plain, No. 8 gage..	3 15	to 3 17½	0.84 to 0.85
Wire, barbed, 4-pt. No. 12 B.W.G.	9 12½		2.09
Wire nails, base	5 15		\$1.26 a keg



galvanized sheets, but the market is still rather quiet. Black sheet demand is restricted with Japanese light gage sheet buying small.

### Chile Advances Duties on Iron and Steel

WASHINGTON, Dec. 16.—Iron and steel products and hardware are included among 550 items on which Chile has increased tariff duties by 35 per cent, effective 60 days from Dec. 10, says a cable from the commercial attaché at Santiago.

### Tin Plate Reduced by German Mills

HAMBURG, GERMANY, Dec. 1.—Recent reductions in British quotations on tin plate have been followed by German makers, who are freely offering tin plate for export at 16s. (\$3.89) a base box, f.o.b. port, with few buyers. Foreign trade in galvanized sheets is affected by the keen competition of Belgian and Japanese makers. Belgian sellers are quoting £10 15s. (\$52.30) a ton, f.o.b. Antwerp.

### German Furnace Scrapped

HAMBURG, GERMANY, Dec. 1.—The Grunbacher Hütte, one of the oldest blast furnaces in Germany, has been blown out and will be dismantled. It has been in operation since 1819, with only temporary suspensions for relining and improvements.

### 1929 Motor Vehicle Output 34.1 Per Cent Over 1927

Motor vehicles and trailers, shipped and delivered in 1929 by American factories amounted to \$3,415,636,810, an increase of 34.1 per cent, compared with \$2,546,807,058 reported for 1927, according to the Bureau of the Census. In addition, the value of parts, accessories, etc., amounted to \$302,359,743, making a total output of \$3,717,996,553, an increase of 30.5 per cent over the 1927 total of \$2,848,442,843. The figures relate only to manufacturers whose principal products are complete motor vehicles and trailers, and do not include the products of establishments engaged primarily in the manufacture of bodies, parts and accessories.

### New Export Shippers' Document Available

A "document of continuous possession" is being provided to clients engaged in foreign trade by the Bush Service Corp., 100 Broad Street, New York. This document is evidence that the Bush service has taken possession of materials described and has assumed entire responsibility for safe conduct from point of shipment to the specified destination.

Under the certificate, the service

company assumes responsibility for transportation, selecting routes in accordance with the shipper's desire for speed or economy, undertakes to inspect the merchandise as to quantity and condition at time of receipt, during transit and on delivery, and assumes responsibility for all handling, packing, repacking and storage. The documents are issued for any point in the United States, Canada or Europe, except the Soviet union.

### Steel Barrel Output Up in October

October output of steel barrels as reported to the Bureau of the Census by 27 companies, was 616,121 units, or 44.1 per cent of capacity, compared with 564,927 bbl., or 40.3 per cent in September. The October, 1929, output was 629,976 units, or 51.4 per cent of capacity.

### Steel Furniture Shipments Gained in October

Shipments of steel furniture stock goods as reported to the Bureau of the Census by 34 manufacturers in the business group gained slightly in October, when the total was \$1,900,865, compared with \$1,879,151 in September, \$2,983,615 in October, 1929, \$2,754,135 in October, 1928, and \$2,218,602 in October, 1927. October shipments of shelving compiled from reports of 16 companies totaled \$592,471, compared with \$497,453 in September and with \$979,236 in October, 1929.

Orders for steel furniture in the business group were valued at \$1,854,679 in October, against \$1,794,751 in September. Orders for shelving furniture in October rose to \$546,968 from \$512,273 in September, according to reports from 16 companies.

### Bituminous Coal Stocks for 33 Days

Supplies of bituminous coal in industries in the United States are estimated by the National Association of Purchasing Agents as equivalent to 33 days' use at current consumption rates. By-product coke plants have enough for 34 days, electric utilities for 50 days, railroads for 22 days, steel mills for 24 days and other industries for 31 days.

The total on hand Nov. 1 is placed at 34,017,000 net tons, which is about 1 per cent above that of a month earlier and is the largest total since March 1. Consumption by industries was 31,651,000 tons in October, or nearly 10 per cent higher than in September. It was the highest figure since last May. Production in October, at 51,726,000 tons, was the greatest figure since January, and represented an advance of about 18 per cent over September.

### Japan Seeks Mill Values for Steel Merger

YOKOHAMA, JAPAN, Nov. 10.—Combination of the Government and private steel companies into a single corporation appears nearer consummation than at any time since 1919, when it was adopted as one of the economic policies of the Hara ministry. In seeking a basis of plant valuation for such a merger, many of the steel companies included are suggesting that the paid-up capital should be taken at its actual value based on current price of the shares, and to it should be added the debentures and loans to the companies. This total would be accepted as representing the assets of the works, plus actual material on hand.

Under present conditions, the actual value of shares plus bonded indebtedness of the companies under consideration for the merger would amount to about 146,000,000 yen (\$72,450,000). These privately operated steel companies produce an annual total of about 1,000,000 tons of steel, or about one ton of steel for 146 yen (\$72.45) of capital, while the Government Steel Works, which has a capacity of more than 1,000,000 tons, annually produces about one ton of steel to every 177 yen (\$87.83) of capital. On such a basis, merger of the private companies and the Government works would result in a corporation with capital in excess of 300,000,000 yen (\$149,000,000).

### 10-Year Ship Program to Require \$270,000,000

WASHINGTON, Dec. 12.—The American merchant marine 10-year program, which began Aug. 1, 1928, will involve the expenditure of more than \$270,000,000 for the building of 54 new ships and the remodeling of 36. Some of the contracts have been awarded. The portion to be spent in the fiscal year ending June 30, 1932, was carried in the Postoffice Department appropriation bill reported to Congress last week. The appropriations represent requirements covering ocean mail pay to American ship-owners.

### Further Shrinkage of Trackwork Shipments

November shipments of trackwork for T-rail track of 60 lb. and heavier are reported by the American Iron and Steel Institute at 4212 net tons, a drop of 19 per cent from the 5192 tons of October. This makes the smallest month's total on record, as were the three preceding months, one after another. The comparison with a year ago shows 11,326 tons at that time.

For the first 11 months of the year the total has been 104,942 tons. This again is the smallest on record since these figures have been gathered, and compares with 151,289 tons in the first 11 months of last year.

# Making Apprentice Training Pay Dividends in Satisfaction

(Continued from page 1862)

tion. It is taken to mean a man who can act on his own initiative, plan his own work and carry it out, and solve his own ordinary problems without assistance. According to this viewpoint, a machinist is not a man who knows how to operate a milling machine or a boring mill; he is a man who thoroughly understands the operation and the maintenance of all standard machine tools and is sufficiently familiar with their fundamental principles to grasp the construction and operation of all kinds of special machines.

## Prevalence of Mass Production No Bar

Even the most highly developed mechanical manufacturing plant requires trained men for planning and supervision of work, for adjustment and repair of machinery, and for building and maintenance of the many fixtures and appliances without which automatic manufacture is impossible. Moreover, many essential industries cannot be established on an automatic basis.

In the manufacture of locomotives, ships, machinery for power plants and steel mills, for instance, skilled mechanics will be employed for years to come, just as they have been in years past. After all, only a limited number of commodities are in such demand that thousands of units must be produced every day, so that automatic production may be justified.

## School Requirements

Compulsory school attendance for apprentices is one of the most important features of the Wisconsin apprenticeship law, and probably the outstanding characteristic which distinguishes modern apprenticeship from the apprentice training courses which began to disappear about 30 years ago. This legal requirement places school attendance where it belongs as an essential and adequate training, and not merely a finishing touch which the employer may add to his course or omit as he wishes.

Accordingly, the apprentices are required to attend the local vocational school four hours a week during the school year, to receive the related instruction necessary for their apprenticeship, and the school authorities are made responsible for proper teaching of mathematics, blueprint reading, elementary science and mechanics, industrial subjects, and even some cultural subjects.

Although the law requires that each apprentice attend school until he has completed 400 hr. of school work, the commission reports that most apprentices are required by their employers to attend the vocational school during their entire apprenticeship.

In those communities in which no

vocational school has been established, special classes are arranged under the supervision of the State Board of Vocational Education. Part-time instructors for these classes are secured from the local trade or industry, or from members of public school faculties. In other cases a number of communities together engage an instructor in a given trade, who divides his time between the communities. The salaries of these itinerant teachers are paid partly by the Federal Government, partly by the State, and partly by the local communities, just as in the case of regular vocational teachers.

## One Apprentice to 18 Employees

In 1911 there were 460 apprentices in shops of members of the National Metal Trades Association in Milwaukee. This number has grown to 1068. The total number of employees in the member shops is ordinarily about 20,000, so that there is one apprentice for every 16 or 18 employees.

Apprentice graduates in these machinery-building plants have become an important factor in the development of strong organizations of mechanics, foremen, inspectors, engineers and other highly trained personnel. In many plants the apprentice graduates have become the principal source from which important members of the organization are recruited.

In one large organization which operates three foundries, no molders have been engaged for a number of years other than graduates of their own apprentice-training program. In another large organization no foremen have been hired for ten years or longer, other than graduates of apprentice courses in the plant, with the exception of department heads who have become members of the organization when smaller manufacturing plants were absorbed.

## Large Wastage in Skilled Labor

Speaking in 1924, Dr. Magnus W. Alexander pointed out that 5 per cent of the skilled employees in every industry are lost every year as the result of death, retirement, transfer to other occupation, and other normal causes. Accordingly, there should be graduated in every trade a sufficient number of apprentices each year to replace the 5 per cent who are thus lost. And to graduate 5 per cent of the total skilled mechanics a year, it would be necessary to employ a number of apprentices equal to at least 20 per cent of the total skilled mechanics in the trade.

It is perhaps unnecessary to explain that such a large quota of apprentices is probably not employed in any single trade or occupation in the State. However, the movement has been started,

methods have been established and proved to be successful, and upon this foundation it must be possible to build in the years to come a constantly increasing apprentice-training activity which should in time be adequate.

## Discussion on Apprentice Training

SEVERAL speakers participating in the discussion on the two papers relating to apprentice training in Wisconsin and Virginia respectively added considerable to the subject. It is relatively easy to impart principles, said one man, but it is not so easy to impart that imponderable thing which we know as trained skill. That must come from constant repetition of work under adequate supervision. The opinion was expressed that 90 per cent of all operating failures are foremen failures caused by instruction or supervision which is not suitable.

Conference methods for foremen training were reported to be the methods giving best results. Books and lectures are all very well as adjuncts to this method, but they must tie in with conferences if they are to provide for best effect.

That there is a distinct trend toward cooperative school courses was asserted. The speaker pointed particularly to three such courses at the Massachusetts Institute of Technology, and to the prevalence of that type of cooperative work at the University of Cincinnati, Georgia School of Technology, Marquette University and other places.

## Training Is Most Important

One of the most important problems before the American people for the next 15 or 20 years, one man asserted, is to train properly our working forces. We shall always need the skilled craftsman to convert into iron, steel, stone, wood and other materials the beautiful dreams of the engineer. This speaker paid a particular tribute to the work of the Federal Board of Vocational Education and to its coordinating influence in leading the training movement now so well under way.

There are three main objectives in such a training system, he said. The first is to train the hands and develop a muscular coordination. The second is to train the man's intelligence in performing his daily tasks with least lost motion. However, thirdly, we must see that his heart is not neglected. All three must be in the scheme or it will be unsound.

There is a very close correlation between native intelligence and a man's progress in training for any craft. For this reason there should be a good connection between the preliminary school work and the training course if the best success is to be made of apprentice training.

More than this, however, we must have a foreman who is up to date. This speaker expressed preference for an instructor who is a young craftsman not too far from boyhood him-



self. He should be a man who can take part in boyish activities and can even lead in them. At the same time, of course, he must be a master craftsman and a competent teacher.

Management must be wholeheartedly back of any scheme of apprentice training which is to be successful. Only in this way can there be the necessary mutual confidence between management and the boys undergoing training.

#### Conditions Differ Between Industries

It is entirely possible that Mr. Bailey's three laws may not be so well suited to smaller industries as they are in the large establishment with which he is connected, said John A. McCarthy, special supervisor of trades and industries in New Jersey. Some of the factors in the first law, which states that candidates must be physically fit, mentally superior and morally hopeful, might be difficult to evaluate in a boy and may not become apparent for some time after his selection as an apprentice. A high-school training may not be so necessary for some trades as it is for those involving the more highly technical work. Particularly, we should not confuse schooling with intelligence.

Management's part in the program must be decisive. The speaker greatly deplored the fact that some managers in the present state of depression in industry have been curtailing or abandoning their apprentice training courses and turning loose a lot of half-trained boys. They are not, however, abandoning their mines or other sources of raw materials. The speaker believes that they are not taking advantage of their opportunities and are not looking adequately ahead to the future expansion of their business activities.

To make a first-class apprentice it is necessary to develop both trade skill and technical knowledge. The latter, however, must not be over-emphasized. Many an apprentice training system has been wrecked through trying to give the boys an engineering education. Such an aim is altogether too high. In one such case only four boys out of 350 finally completed the course satisfactorily and received their diplomas.

#### Cooperation Between Schools and Industry

An apprentice training system a little out of the ordinary was described by E. W. Kempton, educational director of the American Steel & Wire Co., Cleveland. He reported that the training course is becoming so well known that those back of it are being deluged with applications from boys seeking an opportunity to acquire skilled training. This fact somewhat negatives the common assertion that boys will not go into anything except the white-collar class.

These boys are taken from high school and from grade schools and there are even two of them now who have been through two years of col-

lege training. The utmost cooperation is had from the school authorities, even in those districts which naturally would feed the white-collar classes. There is, however, a certain handicap through the fact that many executives seem to have no desire to cooperate with the schools in this manner.

This system is a cooperative one between the schools and industry. To illustrate—a boy out of the eighth grade spends each day four hours in his classroom and four hours in a shop for the first year. His instructors in the shop work are all men who have been training under the supervision of the Federal Board of Vocational Education.

In the second year the boys are offered to industry as apprentices. The system has been at work long enough so that the worth of boys educated in this way is well known. There is no difficulty in placing them, as industrial managers are after them. In the second and the third years the boys alternate two weeks at full time in school and two weeks full time in the shop. Half of the number are in the schoolroom, while the other half are in the shop. This keeps the number at work in each plant from day to day about uniform.

In the fourth year the boys spend almost all their time in industry, but

have to put in each week four hours in the schoolroom for special instruction. This virtually completes the course. There is, however, a fifth year during which the boys are still under supervision, more for the purpose of getting them tied up with evening school courses than anything else.

#### Fits Small Plant as Well as Large

This plan is reported as having been most successful. It works just as well in connection with a small manufacturer as with a large one. Any plant can fit into this picture, even if it has only 15 to 20 employees.

Stress was laid by this speaker upon the necessity for getting younger blood into the trained craftsman class. The average age of the all-around skilled mechanic is constantly increasing. Unless, therefore, we get in a large number of younger men, we shall be faced with a menace to the proper conduct of our industrial fabric.

Character and morale were stressed as indispensable by Dr. D. S. Jacobus, consulting engineer, Babcock & Wilcox Co., New York. These are things, the speaker said, which cannot be taught by precept. The only way they can be instilled is through the example of those in contact with the boys and in authority over them.

## New Trade Publications

**Electric and Pot Type Furnaces.**—Hevi Duty Electric Co., Milwaukee. Bulletins 930 and 1030 illustrate and describe pot furnaces used for immersion heat treating of small parts; for lead or salt bath treatment of tools, drills, taps, etc.; also the electric vertical pressure carburizer, especially adaptable to certain types of work where tumbling is advisable.

**Electrical Controls and Timers.**—Reynolds Electric Co., 2650 West Congress Street, Chicago. Bulletin 803 deals with special controls and timers, used for a large variety of work in industrial plants, mills, mines, shops, or wherever it is desired to open and close electrical circuits automatically at predetermined periods.

**Industrial Lubrication.**—Alemite Corporation, 0000 North Crawford Avenue, Chicago. Bulletin No. 4 of seven pages, devoted to industrial lubrication. Illustrations show installation of Alemite fittings.

**Temperature Cutout.**—Hevi Duty Electric Co., Milwaukee. Circular illustrating and describing automatic excess temperature cutout, which implies safe operation of furnace equipment without constant personal attendance.

**Electrodes.**—Fusion Welding Corporation, 103rd Street and Torrence Avenue, Chicago. Circular describing in detail the effect of green surfacing on the welding arc, the deposit metal and operating characteristics of the electrode, also the action of green surfacing as it is vaporized in the arc.

**Fabric-Welding Machine.**—Thomson-Gibb Electric Welding Co., Bay City, Mich. Circular illustrating and describing special Thomson-Gibb auto-

matic fabric welder, which is said to weld 151,000 sq. ft. of fabric, or 54 tons, in a 10-hr. day.

**Floor Trucks.**—Lewis-Shepard Co., Watertown, Mass. Illustrated catalog of 15 pages featuring a new line of both standard and special floor trucks, designed to meet specific problems.

**Electric Demand Meters.**—Sangamo Electric Co., Springfield, Ill. Bulletin 80, 15 pages, illustrates and describes type S Kva.-demand meters. Motors are built for 115-volt operation, and for either 50 or 60-cycle operation. Connection diagrams are shown.

**Automatic Controllers.**—Monitor Controller Co., Baltimore. Bulletin 116, 7 pages, describing and illustrating a.c. and d.c. controllers for automatic printing presses, etc., with automatic starting, pre-set speed, magnetic reversing and automatic braking.

**Forgings.**—Camden Forge Co., Camden, N. J. Seven-page bulletin, illustrating and describing equalizers, drawbars and other forgings of hammered wrought iron, carbon steels or alloy steels, for railroad service.

**Thermostat.**—General Electric Co., Schenectady, N. Y. Circulars GEA-1318 and GEA-1265A illustrate and describe quartz-rod thermostats for use with metal-melting pots, and a thermostat for use with industrial heating units.

**Pipe Hustler.**—Harnischfeger Corporation, Milwaukee. Bulletin PH-2 of seven pages, containing a general description of the P & H pipe hustler designed for handling pipe, used also on all field operations, including truck-unloading, stringing, lining, stabbing and lowering pipe as well as back-filling.

### Composition of Open-Hearth Bath at Different Levels

THE committee of the Verein Deutsche Eisenhuettenleute on open-hearth practice has made an extensive investigation with the object of discovering to what extent the bath of the furnace varies in composition at different levels and at different stages in the refining process, and from the results to obtain some idea as to the influence of the speed of diffusion and other factors affecting the process.

According to S. Schleicher in *Stahl und Eisen*, July 24, 1930, pages 1049 to 1060, the method of taking samples of the bath throughout the whole depth was as follows: A steel bar about 15 ft. long and 1½ in. in diameter was bent to a right angle, the short leg of the bent bar being about 3 ft. long. This part was then wrapped around with sheet lead 2 mm. thick. The whole bar was slid forward into the furnace, the lead-sheathed part instantly plunged straight down to the bottom, and withdrawn after 4 sec. On withdrawal the lead-sheath has disappeared and the immersed part of the bar is coated with a layer of steel 2 to 4 mm. thick. The lead lasts just long enough to prevent the adhesion of slag to the bar, which is still cold enough, on touching the bottom, for the liquid steel to freeze on to.

The chilled shell peels off quite easily if split longitudinally, and provides samples representing the composition of the steel throughout the bath depth. Eight tests taken in this way during a heat show surprising variations from the average composition at different levels. The furnace was of 65 to 70 tons capacity, and the bath depth was 24 to 28 in.

### Sponge Iron Process Not a Competitor of the Blast Furnace

NO sponge iron process can be considered a competitor of the blast furnace for the production of pig iron, says E. P. Barrett in an article, "Sponge Iron and Its Relation to the Steel Industry," in *Mining and Metallurgy*, August, 1930. He believes that sponge iron should be considered only as a raw material for the production of high-grade steel.

Sponge iron should be melted in the electric furnace. This is especially necessary should the sponge iron contain more than the tolerant limit of sulphur. After the sulphur has been eliminated, the hot metal may be transferred to an open-hearth furnace for finishing. This would be advantageous in making heats in which sponge iron would be used as only a part of the charge. From 500 to 1000 kwhr. would be required to melt one ton of metallic iron in the form of sponge iron and to eliminate the sulphur to within the tolerant limit. The power would vary depending on the impurities in the sponge iron.

The cost of melting in the electric furnace and removing the sulphur will be higher than for melting an equal weight of scrap in the open-hearth furnace. The advantages gained from the use of a purer molten metal may, however, be worth the extra cost. While it is metallurgically possible to produce pig iron from sponge iron, it cannot be done commercially. The cost of melting and carburizing in the electric furnace to produce gray iron is prohibitive, except in a few spe-

cial cases. In places distant from steel-producing centers, where cost of transportation is high and cost of electric power is cheap, it would be possible to utilize a limited tonnage in gray iron foundries using electric furnace melting.

### Composition of Basic Open-hearth Slags

A report of the steelworks committee of the Association of German Ironmasters by Dr. Siegfried Schleicher in a recent issue of *Archiv für das Eisenhüttenwesen* states that by means of a series of open-hearth slag analyses it was attempted to establish (if any) what laws regulated the chemical composition of open-hearth slags. It appeared that the amount of the manganese content of the slags was influenced in a far-reaching way by the CaO+MgO content, and, furthermore, that the iron content was reduced with increasing silicic acid and phosphoric acid contents. Furthermore, it was shown that the theoretical composition of the slag could be computed from its iron and manganese contents.

### Correction

In the chart "Milestones in a Lifetime of Progress" which appeared in the 75th Anniversary Number of THE IRON AGE, published Nov. 20, credit for the first installation of by-product coke ovens in the United States was given to Hoffman. The Semet-Solvay Co. says that the first successful commercial installation of by-product coke ovens was made at the plant of the Solvay Process Co. and was operating in 1892. This plant consisted of twelve ovens which were constructed on a design of Louis Semet. The Otto-Hoffman installation of 1894 (60 ovens at Johnstown, Pa.) was probably the first to be operated in conjunction with a blast furnace.

### Straight-Line Output and Mechanical Handling in a Radiator Plant

(Continued from page 1839)

to their starting point, where they are removed from the continuous chain by air hoist and loaded on a trailer for removal by gasoline engine truck to storage in the company's warehouse.

The hot water for the washing machine is supplied from the plant boiler room. An oil burner is used to heat air for the drier, the air being drawn through the drying chamber by motor-driven fans—one fan drives the air into the drier and another draws it from the drier and passes it outside through the roof.

Formerly radiation was shipped unpainted but now all of it is given a priming coat. The conveyor for the painting system was constructed and installed by the Anchor Steel & Engineering Co., Detroit.

### Stacking Radiators on Side Conserves Warehouse Space

The warehouse has capacity for 3,000,000 ft. of radiation, but ordinarily carries about 2,000,000 ft., since part of the space is used to store boilers and other products of the company. More radiation can



## Business as Others See It

Digest of Current Financial and  
Economic Opinion

**L**EADERSHIP has become the demand of the day. A business Moses who can guide us out of our depression wilderness is urgently wanted. And commentator after economist after industrialist bewails the present lack of such a genius.

Meantime a little more lost ground is surveyed with the fortitude of those who are looking to 1931—and not earlier—for the rising sun of another era of prosperity. Colonel Ayres, of Cleveland, expresses the belief that slow business recovery during that year will bring us to "normal" by early 1932. He expects 1931 to show lower industrial wages than 1930, lower building costs and lower cost of living.

"There seems to be fair prospect," he says, "that 1931 will be characterized by progressive improvements, instead of by recurrent declines. . . . Developments should include rising trends for short-term interest rates, bond prices and stock prices, and advances (before the end of the year) in wholesale prices and industrial employment."

### Better Feeling Apparent

Such changes as have occurred during the past week, "though in

general they denote a further shrinkage of business activity, also mark changes only moderate in amount," says *Analyst*, which notes a somewhat better feeling in certain quarters. And *Commerce and Finance* feels that "distributive trade has held up remarkably well, and in some lines it is showing a gain over last year. . . . The return of prosperity does not seem to have been much delayed by the week's happenings."

This commentator wonders whether prices may not have turned the corner. He shows a sizable recovery from recent lows in wheat, corn, cotton, silk, rubber, hides, sugar and coffee, all of which were quoted well below present prices at dates varying, with the commodity, from four to 12 weeks ago.

### Heavy Wages for Capital

Dividends in 1930 have topped those of 1929 by a substantial amount (11 per cent), according to Alexander Hamilton Institute. But the warning is sounded that 1931 will not fare so well, as the second half of 1930 has shown already a trend toward lower distributions. Dividends and interest

for 11 months are reported at \$7,288 millions, against only \$3,415 millions in the "boom" year 1920 (12 months).

Another comparison with the past is made by La Salle Extension University. It finds business profits for the first nine months only 7.94 per cent lower in 1930 than in 1927. And "total volume of business done by many companies is not far from the figures of that year." Allowing for normal growth, however, "business activity has fallen off from the computed normal by almost as much as in 1921. . . . And 1921 was followed by a steady and substantial recovery."

Inflation is to follow our emergence from a too-severe deflation, thinks *Business Week*, which says: "There can be no recovery from genuine, world-wide deflation such as has been permitted to take place during the last half of 1930, except through an equally drastic compensatory process of inflation."

Wages in many industries remain "unduly high," and must come down, in keeping with the reduction in living costs, says *Financial Chronicle*. That authority calls the attitude of labor unions, in resisting this change, one of our "troublesome problems."

be stored in a given space than formerly, since radiators are now stacked on the side instead of an end. An Elwell-Parker industrial boom crane, used for stacking, has a boom that can pile radiators virtually up to the ceiling of the warehouse.

A loading platform on one side of the warehouse is on a level with box car floors, permitting radiation to be rolled into the cars without the necessity for any hoisting. Motor trucks are loaded out of another side of the building.

### Laboratory Checks Materials

A feature of the foundry is a laboratory. Here molding sand is tested for moisture every 30 min., and for permeability once a day. The moisture test is done by the drying method. First it is weighed as received and then dried on an electric plate and weighed again.

Three core bars are tested and averaged daily. A bucket is hung on the core bar and a trigger releases sand from a storage chamber to the bucket. When the bar breaks the sand in the bucket is weighed.

Iron test bars are tested for tensile strength and flexibility, and once a week a complete chemical analysis is taken of the metal as cast. Three test bars are made daily and the 18 for the week furnish the aver-

age analysis for that period. The shrinkage of the iron is also measured.

## Precision Forging—the Newer Idea on Drop Forgings

(Concluded from page 1841)

That genuine interest is being shown in this new development in the making of forgings is indicated by the number of engineers who have visited the Billings & Spencer shops during the past six months to work out, at first hand, new tolerances in line with the newer methods of production.

From present appearances, it is reasonable to say that the next two or three years will result in probably greater improvement in drop forging quality and possibilities than took place in the last two decades. While the outstanding thought during the last period was how to cut the cost while maintaining quality, the next step in drop forging is undoubtedly going to be how to make a better forging, which will materially lower machining costs and thus make for a saving in the finished product. It is interesting to speculate on what will be accomplished the next few years when well established drop forge shops will vie for closer tolerances and better finish.

# THIS ISSUE IN BRIEF

December 25, 1930

## To Adopt Wage Incentives Successfully

Don't bother the workers with details of how the pay is to be figured. Show them how much they will earn per day by attaining a certain output.—Page 1905.

\* \* \*

## Discourages Washroom Loitering

Lockers and washrooms are located on a mezzanine floor above the main floor. Workmen going up or down the mezzanine steps are in full view of the superintendent and foremen.—Page 1910.

\* \* \*

## Doubles Screw Machine Output

By applying a transfer arm and fixture, spindle bearing is made completely on screw machine.—Page 1913.

\* \* \*

## Indicators Speed Milling Operation

Operators feed to stops in indicators calibrated to read in 0.001 in. Thereby the operators read results rather than feel for them.—Page 1914.

\* \* \*

## Core-baking Costs Lowered

Continuous oven saves Packard space equal to a \$30,000 building. Baking time is reduced from 5 hr. to 3 hr.—Page 1916.

## Greater Production, Fewer Workers

Changes in processing, material-handling and installation of a wage incentive system, with a bonus system for foremen and superintendents, permit establishing of costs by sizes per 100 ft. of pipe produced.—Page 1904.

\* \* \*

## Superintendent's Bonus Depends on Foremen

If foremen's performance for the month exceeds month's standard by 10 per cent, superintendent's bonus is 10 per cent of his salary.—Page 1907.

\* \* \*

## Selects Gas for Screw-Hardening

Gives lowest cost per useful heat unit, screw manufacturer believes, as furnaces can be allowed to stand idle without a great loss in efficiency.—Page 1923.

\* \* \*

## Uneven Hardening Temperature Avoided

Heads of furnaces are made to extend farther than normal into the retorts to avoid a lower temperature at the front end than in the rest of the furnace.—Page 1923.

\* \* \*

## Oxidation of Hardened Parts Prevented

Furnaces are placed just enough higher than normal height to obtain a quick sliding action of heated parts from furnace to oil bath. Exposure to air is reduced to a minimum.—Page 1924.

\* \* \*

## Factory Roof Insulation Costs Nothing

Saving made in the purchase of smaller heating plant pays cost of insulating factory roof with a layer of Celotex, which reduces loss of heat by radiation.—Page 1910.

\* \* \*

## Don't "Sweat" Galvanizers' Dross

"Sweated" dross will not give good metal. When put back with good zinc it makes more dross.—Page 1933.

## To Make Welds Stronger

To increase strength of T joints of chrome-molybdenum tubing, use a larger tube instead of adding plates, straps, etc. If bending stresses are low, weld a U strap around the joint.—Page 1926.

\* \* \*

## Lake Ore Will Last Thirty Years

If methods can be devised for concentrating Lake Superior low-grade ores, the time of exhaustion will be extended.—Page 1928.

\* \* \*

## Tool Involute Profile Quickly Checked

Special instrument consists of a base-plate and disk. A plug to locate the cutter and a straight-edge are held in contact with base circle disk. A five-to-one lever is mounted on straight-edge. Errors are recorded on dial indicator.—Page 1909.

\* \* \*

## Japanese Prove Adept in Sheet-rolling

German-trained Japanese workmen exceed the rated capacity of semi-continuous sheet mill within a year of installation.—Page 1930.

\* \* \*

## Aluminum Weld Corrosion Prevented

If welds are hammered and polished on both sides they will be as free from corrosion as a sheet of plain aluminum. By making aircraft tanks in two parts inside welds can be finished.—Page 1934.

## NEXT WEEK

### Annual Review Number

with its statistics, records of technical and economic progress and its forecasts—an institution in itself, appearing on the first Thursday of every January, replete with sign posts to guide industry in the coming months.



**These jobs are a problem for any production manager**  
(because this work ordinarily requires constant tool changes)

**but—**  
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